

# Aviation Week

*Including Space Technology*

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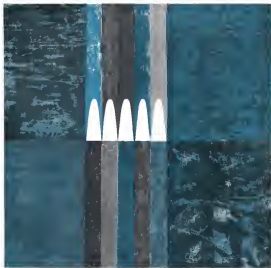
A McGraw-Hill Publication

November 24, 1958

**Navy Studies  
Liquid Engine  
Packaging**

Army Jupiter IRBM





## BRUNSWICK TURNS OUT SHAPES WITH FANTASTIC FIDELITY

Brunswick has revolutionized the technology of fiberglass laminates with its exclusive new Strickland II Process (SRP). This unique method not only creates components with extremely high strength-to-weight ratios and heat resistance (up to 600°F.), but it also opens up a new production space that meets dynamic new standards for precision.

SRP filament wound laminates can be easily produced by fully automated machines. Whether one or one thousand . . . simple or compound configurations, including monocoque structures, SRP laminates meet the most rigorous space age specifications for precision and uniformity in skin thickness, size, dielectric constant and contours.

Brunswick research and development groups continually work to extend upper temperature limits and other unique features of SRP laminates. They also offer you additional help solving problems in design, development and fabrication. Write The Brunswick-Baker Corporation, Defense Products Division, 1700 Meeker St., Muskegon, Michigan.

# BRUNSWICK

MAKES YOUR IDEAS WORK

FROM GOODYEAR

## most advanced ice protection for 3 of the world's newest airliners

Legend—dependable ice protection for any aircraft surface or shape. Electrothermal sheathing by Goodyear conforms readily to thinner wings of jet aircraft, has specially compounded cover for high erosion resistance. Available in two types: electrically conductive rubber or rubber-embedded woven wire elements.



Automatic System Control. Transistorized "black box" picks up signal from Ice Detector switch—automatically adjusts heating equipment. At same instant, flashing light in pilot's field of view cautions. It is first fully automatic ice shedding system ever devised.



Automatic Ice Detector senses ice buildup—initiates warning, battery test, can shut off. Lightweight "brake" enables info on stream, flash warning to pilot as clouds enter wing conditions. Detector has been tested in Arctic Circle operation—USAF qualified.



New Goodyear Prop Ice Protection system—engineered for heavy, proven.



New Goodyear SRP offers you this new, high strength, heat resistant, electrically conductive ice detector and system controller.

Continued Research of Goodyear and National Research Council of Canada produced improved Automatic Ice Detector system—developed by National Research Council and Canadian Applied Research Limited—is represented solely by Goodyear in the U.S. For help with your icing problem, write Goodyear, Aviation Products Division, Akron 16, Ohio, or Los Angeles 54, California.

# GOODYEAR

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a new  
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# THE HILLER 12E



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*By far the most powerful helicopter in its class. Suddenly the Hiller 12E has made light utility helicopter service more practical and economical than ever before. The reason is power. More usable power than any helicopter of its size has ever been able to harness. The result is more payload per hour—more payload per dollar! The result too is versatility: the ability to take on the toughest assignments industry and government can give it. And to be ready with an off availability.*

*For the full story of the 12E's performance in jobs for many industries, send for the name of the Hiller 12E dealer or Helicopter Control Center nearest you write.*

## AVIATION CALENDAR

(Continued from page 5)

- Washington, D. C. Meeting will be held in connection with the 12th Air and Missile of the American Arm. For the Advancement of Science.
- Jan. 12-14-1955 National Symposium on Reliability and Quality Control in Electronics. Raffles Hotel, Philadelphia, Pa.
- Jan. 19-21-1955 Annual Convention. Helicopter Year of America, Villa Hotel, San Mateo, Calif.
- Jan. 26-29-1955 Annual Meeting. Institute of the Aeronautical Sciences. Sheraton Hotel, New York, N. Y. Honorary Night Dealer Jan. 27.
- Jan. 27-29-1955 Annual Helicopter Symposium (tentative). Raffles Hotel, University of Medicine, New York, N. Y.
- Jan. 29-30-1955 Annual Technical Conference. Society of Flight Engineers (tentative). Commodore Hotel, New York, N. Y.
- Jan. 29-30-1955 Annual Midwest Helicopter Conference. sponsored by Aviation Research Foundation. Illinois Institute of Technology, Chicago, Ill.
- Feb. 1-3-1955 Award Luncheon and Meeting of Condenser. Raffles Hotel, Florida. Society of the Florida Institute of Engineers. Raffles Hotel, Chicago.
- Feb. 12-13-1955 Solid State Circuit Conference sponsored by Institute of Radio Engineers. Professional Group on Circuit Theory, American Institute of Electrical Engineers. Committee on Electronics and University of Pennsylvania, Philadelphia.
- March 1-4-1955 Western Joint Computer Conference. sponsored by Institute of Radio Engineers. American Institute of Electrical Engineers and San Francisco. Sheraton Hotel, San Francisco, Calif.
- March 5-6-1955 Flight Population Meeting (tentative). Institute of the Aeronautical Sciences. Hotel Carter, Cleveland, Ohio.
- March 8-9-1955 Engineering meeting on the future of aviation. sponsored by Gas Turbine Division of the American Society of Mechanical Engineers. Cincinnati, Ohio.
- March 30-31-1955 Western Helicopter Symposium and Congress. American Society for Aerial Photo. Sheraton Hotel, San Francisco, Calif.
- March 31-Apr. 2-1955 Institute of Electronics. North International Symposium. Sheraton Hotel, New York, N. Y. Co-sponsored by Division Research Agencies and Institute of Radio Engineers.
- Apr. 7-10-1955 Working Shop and 40th Annual Convention. American Helicopter Society. International Aerodrome, and Hotel Sheraton, Chicago, Ill.
- May 4-7-1955 Annual Flight Test Symposium. sponsored by the Instrument Society of America. South, Seaside, Olympic Hotel, Seaside, Ore.
- May 19-21-1955 National Telecommunications Conference on Investigation of Space Research Office and Communications. Hotel Denver, Colorado. Sponsored by National Radio Society. Institute of the Aeronautical Sciences, American Institute of Electrical Engineers and Instrument Society of America.



COMPUTATION—  
IN THE  
DEADLY GAME  
OF SURVIVAL

## BURROUGHS SYSTEMS STUDIES PLAY A VITAL ROLE IN DEFENSE

**Problem:** How to purchase good air defense against enemy bomber and missile threats. **Solution:** Systems Studies of all operational problems—studies whose very heartbeat is electronic computation. Burroughs is acknowledged a master in all phases of such computation and its related areas, through its products, combination of technical competence, outstanding experience and the most advanced research facilities.



**Burroughs Corporation**

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Truck and others supply pneumatic power for main engine starting, cooling and heating, electrical power for commercial jet-powered aircraft.



Small units for main engine starting, air conditioning and electrical power for military aircraft.



AllResearch ARA-1A trailer for starting military aircraft. Nearly 2,000 in the field.

## Reliable and versatile ground support



RA transportable pod for engine starting, cooling of electronic equipment and pre-flight checkout for military aircraft.



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ments, main pre-flight check out, removal of water and ice from aircraft and equipment, supply of DC or AC electrical power at any required frequency, and low pressure, high flow air for operation of a variety of station systems. The units have push button starting and operate without delay under all weather conditions.

The Garrett Corporation, through its AllResearch division, is the world's largest producer of lightweight turbine machinery. The AllResearch Aviation Service Company can package both AllResearch equipment as well as that of other manufacturers to meet your individual ground support requirements. Your requests are invited.

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The U. S. Navy's guided-missile the *Regulus II*, built by Chance Vought Aircraft, is capable of delivering a nuclear warhead with "pin point accuracy" to targets over 1,000 miles distant at speeds in excess of Mach 2 and altitudes above 60,000 feet. Retardant rivets such as the *Regulus II* guarantee our national security.

Hi-Shear Rivets insure structural integrity in the *Regulus II* by meeting the environmental conditions of high strength at elevated temperatures encountered during missile flight.

*Regulus II*



Research and development in Hi-Shear laboratories has continued to keep pace with advances in the missile industry by investigating new materials, methods and faster design. Hi-Shear Rivets are now being manufactured in a full range of sizes and many materials, including:

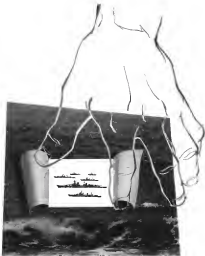
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Hi-Shear Rivets are available in a full range of sizes and materials.



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Today the Singer Manufacturing Company's Military Products Division is performing a substantial role in basic research and development, engineering and production of infrared systems and components. This is just one of many ways in which the Military Products Division—comprised of HRE, Inc., Dahi Manufacturing Company, and Bridgeport—is now serving national defense. Write for complete details.



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Modern high speed flight has cleared the road barrier ... protected the thermal shield. Advanced turbines, rockets and ramjets are producing unbelievable bursts of power.

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The solution: INCONEL family ... because Inconel wrought alloys can withstand extreme stresses in high temperature aeronautical applications.

Canadian Steel Improvement Limited has pioneered many new developments in precision-forged Inconel parts for modern aircraft. By producing Inconel parts in extremely close tolerances with an excellent surface finish, machining time is greatly reduced.

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Janitrol's new lightweight, non-forging line of large diameter couplings provides a safe, easy to connect or disconnect, vibration-proof seal. They are simple to install, clamp together without need of a torque wrench, and ensure positive alignment. Clamp bolts cannot be closed unless pipe surfaces are correctly mated. Total weight of the 36" diameter clamp and two flanges is only 97 pounds. Clamp diameter adjusts to meet pipe production tolerances; a safety lock pin gives extra protection.

Test data: Model illustrated is tested to 15G's with tail pipe attached, and at temperatures to 900 F. Vibration requirements of MIL-E-5272A are met.

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airborne engines to fly faster, higher and further with less mechanical friction drag.

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• Typical of Rollway R & D work is this hydraulic control bearing for the McDonnell Douglas F-4 Phantom II, featuring a tapered, non-separable inner race.

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# OF A REVOLUTION?

Detecting microscopic shaft movement of as little as 11 microns — well beyond the ability of most standard apparatus units — can now be accomplished with new synchro designed and produced by Ketay, and available for immediate delivery. Such increased accuracy, three times better than the highest 354 Spec requirements, is the result of Ketay design and production competence.

Ketay has also developed a complete line of improved thru-bore synchros to the new 354 Spec SPS's (superior 351 Spec 10980). These improved units are available at no increase in cost in a full line of control and torque types, with frame sizes from 64 to 32, Thru-bore construction and stainless steel bearing make them more rugged and more reliable as well as providing better accuracy and greater stability. Ketay is the only approved Bureau of Ordnance source currently manufacturing and shipping all these units.

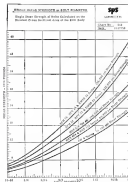
Ketay research and development engineers are regularly working on advanced new components and prototype control systems guidelines for the armed forces and leaders in the aircraft and missile industry. Let them help solve your special problems in component performance and environmental adaptability.

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**KETAY DEPARTMENT, Commack, Long Island, N.Y.**



New SPS super bolts and comparison lockers are the strongest shear fasteners ever offered the aircraft industry, permit significant weight savings in new and weight of riveted joints. Three different shearing configurations are available, any one of which will reduce over 50% of ultimate fastener strength. Units are serviceable to 150°F.



Greater shear strength. Graph shows shear strength vs. diameter for various diameter series of different shear bolts. Top represents plot for the new SPS super high strength shear bolts, available in 132,000 and 156,000 psi series. Dashed curves represent present aircraft industry standards.

## New SPS super high strength shear fasteners save you 25-50% in shear bolt weight

132,000 and 156,000 psi units are  
strongest standard shear fasteners ever offered

These new SPS shear bolts are 39 to 64% stronger than the best standard shear fasteners now in use. They automatically save you 25 to 50% in shear bolt weight, because they can be substituted for conventional fasteners one to two diameter sizes larger... with no compromise in reliability.

For example, one of the new 3/8 in. diameter, 156,000 psi shear bolts, capable of design loading of 30,000 lb., does the structural job of a 1/2 in. NAS type weighing nearly 30% more. Or a large surface this can mean a saving of several hundred pounds. Further, the use of smaller fasteners often permits minimization of riveted parts in a joint, resulting in additional weight savings.

The new bolts are forged from 5% chrome high strength steel, then heat treated to 235,000 psi tensile for the 132,000 psi shear series and to 260,000 psi tensile for the 156,000 psi. Both series are available in standard sizes #4-32 through #6-18, with companion lockers of new design. The 132,000 psi shear bolts have a cadmium-black phosphate plating, the 156,000 psi series cadmium plated. For complete information, write Aircraft/Mission Division, STANDARD PIERCE STEEL CO., Jenkintown 3, Pa.

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SPS research is continuously developing fasteners with higher standards of performance. By utilizing SPS high-reliability fasteners in your assemblies, you ensure overall product reliability.

For more information on the full meaning of reliability, write for a copy of the new SPS booklet "High Reliability."

Write for more information on the full meaning of reliability.

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## The Need to Know

The battle of the defense budget, which never really ends, is mounting toward its annual crescendo climaxed by the prompt debate and final action by a Congress overwhelmingly controlled by a political party in opposition to the executive branch of the government. Mr. Neil McElroy, who has made an excellent record during his initial year as Secretary of Defense, faces perhaps the toughest job he has yet tackled in this office. The 170 million citizens of the country and the citizens of our allies all around the world will be totally concerned with the battle of the military Fiscal 1960 budget that is now being fought in the corridors of the Pentagon and the ancient architectural sanctuaries that now house most of the executive offices of the President's staff. In January the battle lines will shift to Capitol Hill where the decisive measures must be made.

It is already clear that the primary consideration of the executive branch of the government is in holding a fiscal ceiling rather than maintaining the defense posture and technical pace that leadership of the free world requires.

### "Affording" Survival

We have never been able to understand the philosophy of those who stoutly maintain that this country cannot "afford" the expenditures that are required for adequate military strength and technical development of our weapons. Nor have we ever understood the protests by which the budgetmen can pick a number and say "this is the absolute maximum we can afford to spend on defense." We saw this supposedly "absolute budget maximum" begin with the \$15 billion annually which President Eisenhower, after arbitrary budget advice to a Democratic administration, secured the country was the absolute limit it could "afford" for defense in the very year before Communists struck south across the 38th parallel in Korea. The life and death struggle of communists against the United Nations of the free world in Korea soon proved that we could not rely "afford" more than \$15 billion annually for defense of our country and our ideals but that expenditures triple and quadruple this supposedly "absolute limit" were required for survival.

During the post-Korean era there was certainly a concerted effort to bring the military budget well below its "let war" level and certainly this was in order. But while this process was taking place we again saw the

emergence of the budgetmen who came up with an "absolute ceiling" that time came thus double the absolute ceiling set by President Eisenhower in 1950. Confronted with this strictly budgetary view of defense problems is that of the military services who view the matter primarily from the viewpoint of their ability to perform the combat roles and maintain they are assigned or would like to be assigned. Both views have something to be desired in achieving the taxpayer's goal of a superior defense at the lowest possible cost.

In recent years it has been the sharp pencil budgetmen who have prevailed over the military requirement advocates and it appears that this situation still prevails in Fiscal 1960 defense budget preparations. There is also a growing effort to gag and muzzle the military men to prevent them from explaining their true adequacies to the Congress and American public. In the execution of military policy absolute obedience to orders is required. But in the formulation of this policy, which is vital to every citizen of this land, it appears to be contrary to the basic democratic process of government to which this country is dedicated to deprive the people of the right to listen to honest views of their military leaders without restraint or fear of professional reprisals.

There has been a strong trend under both Republican and Democratic administrations during the post-war period to make available to the citizens of this country less and less information on the basic issues that shape the future of the world.

### Information Holdout

That trend has never been stronger than it is today. Nowhere have there been more men in high places in the executive branch of the government devoted more strongly to withholding information from the public on vital government business, withholding information than do science to their men men glow and producing the policy that the American public has no "need to know" about how its tax dollars are being spent or how its future is being shaped.

If the American people are ever to really understand such complex and vital matters as the defense budget battles and the technological race for new weapons development they must be given more basic information by their elected and appointed leaders.

—Robert Hoitz



### Pneumatic Power Package

Designed, developed and manufactured exclusively by Randall Engineering Corporation for use in a flight control system for a space vehicle and integrates the following components:

- three valves
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- three
- high pressure relief valves
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## WHO'S WHERE

### In the Front Office

**Harold E. Lawrence** succeeds Clarence C. Webb, Jr., retired, as executive vice president of Continental Air Lines, Inc.

**Robert T. Kelley**, board chairman and president of Dynalene Corporation of America, New York, N. Y., will also be Intercontinental Corp., Garden City, N. Y., a subsidiary of Dynalene Corp.

**Paul Joseph M. Pratt**, dean of the School of University School of Engineering, a director, General Electric Products, Inc., Pitts, Ala., Calif.

**Malcolm Greenberg**, president of the newly formed Complexes Corporation of America, Inc., Main Director of the company is: Mr. Greenberg, Richard S. Lipton, president of Data Corp., and T. F. Williams, vice president of Lawrence S. Rostkler. Other officers are: Murray Ziskind, vice president and director of America; Clifford Chapman, vice president and director of engineering; Ephraim Kahan, vice president and director of planning; Richard D. Green, vice president and director of marketing.

**Clark E. Harnage**, president, Rochester Manufacturing Co., Rochester, N. Y.

**Albert F. W. Pitt**, a vice president and director, engineering department of Pan-American Airlines, Inc., a new subsidiary of Hyatt-Power Corp., New Rochelle, N. Y.

**International Electric Corp.**, Phoenix, N. J.

**General Electric** (79) turbine engine, fitted with a modified afterburner which burned HEP-3 engine fuel, was recently tested at Edwards AFB, Calif., in the first of a series of tests in the North American B-70 and F-105 development program. Fuel tests will be located successfully in subsequent tests.

**Alio Research & Development** Cincinnati will soon announce a 57-mile contract for exploratory development of "nuclear electronics" now under new scientific element capable of performing functions that now require many individual interconnected components (AW Nov. 2, p. 64; Jan. 16, p. 24).

**Compass** previously announced among possible contractors include Bell Telephone Laboratories, Hughes Aircraft, Radio Corp. of America and Spence Electric.

**Ardenberg** Wayne and Central System selected by Air Force in its AFM competition (AW Nov. 17, p. 21) will be equipped to install microwave antennas as well as facilities for direct data link communications when the microsystem is within range of the only working plane's antenna.

When out of range, infrared facilities will be used to ground station and relayed by data link to the microsystem.

**Walter Kidde & Co.** has developed flameout-resistant aluminum fabricated from Fiberglas vessels under test. Rockets are about 50% glass. Materials is designed PCC-50-100. Kidde has developed a 144-in.-long composite open column for a Mach 3 fighter, probably the F-106. Kidde also has developed 15-16 ft. radius for missile applications. Metal also is being used for making main solid propellant cylinders for rocket engines.

**Avco** flight tests at Ft. Belk, Tex., of Radoph's RF-77D turboprop-powered Fiberglas target drone are aimed at reaching altitudes of about 50,000 ft. Flights already have exceeded beyond our bias. Search aircraft have been approximately 140 ft. Propulsion is a Boeing 102 HP turboprop engine producing 190 cph.

## INDUSTRY OBSERVER

**Air Force** is investigating a promising technique for transmitting a modest amount of electric power to reconnaissance satellites by means of large earth-based antennas and extremely high power transmitters.

**Pratt & Whitney** (58) and General Electric (79) turbine engines, both under investigation for North American Aviation's Mach 3 B-70 bomber and F-105 interceptor (AW Nov. 1, p. 27), have airflow capacities of about 350 and 250 lb. per sec. respectively. General Electric's (79), specifically tailored for the two aircraft, is lighter and smaller than the (58), but about the same specific fuel consumption as the Pratt & Whitney engine which was originally developed under Navy requirements.

**Proposed** to build the world's largest antenna, measuring perhaps 1,000 ft. in diameter, to measure electron density of space out to millions of miles and to bounce signals off planets has been proposed by General Electric and Cornell University to the Air Force and Advanced Research Projects Agency. If funding is authorized, the antenna will be constructed by sweeping a parabolic-shaped hole in the ground and installing suitable radio reflecting surface. Two sites have been proposed: already shaped areas in Puerto Rico and Laredo, Tex., where Air Force already has a high power radar transmitter installed.

In efforts to obtain Defense Department approval for development of the Eagle air-to-air missile, Navy is emphasizing Eagle's active radar guidance that would enable such a missile to be directed at a different target in a widely dispersed attack. Alio Research & Development, Inc., is suggesting a substitute for Eagle, one semi-active radar guidance which requires the microsystem to keep its radar aimed at target until the missile strikes, making it better suited to a single-shot interceptive interceptors rather than for Navy's planned "downplay" missile platforms aircraft (AW Nov. 16, p. 26).

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## Washington Roundup

### NASA Man-in-Space Committee

National Aeronautics and Space Administration last week nominated members of a Special Committee on Life Sciences to work with human factors, medical and other problems of NASA's Man-in-Space program.

The committee, which probably will have the task of selecting the first man to be put into space in the NASA program, will be headed by Dr. W. Randolph Lovelock II, an authority on environmental and space medicine and president of the Lovelock Foundation for Medical Education and Research, Albuquerque, N. M.

At the same time, NASA announced that 13 new research advances, consisting of long flights to provide technical counsel and aid NASA in communicating and coordinating its program with industry, universities and other government organizations.

The committee also will review records in progress and unresolved problems and should be investigated by NASA, or other agencies.

Projects assigned the committee are fluid mechanics, aircraft structures, aircrew and space environment, mission, command, guidance and navigation, chemical energy processes, weight savings, mechanical powerplant systems, electrical powerplant systems, structural loads, structural design, structural dynamics, materials, and aircraft operating problems.

The new committee, all of which will report directly to NASA Administrator J. Keith Glennan, are scheduled to be functioning by early next year and will supersede the 28 technical committees and subcommittees of the National Advisory Committee for Aeronautics which was absorbed by NASA upon its establishment on Oct. 1.

### AIA: Name Change Postponed

Aircraft Industries Assn. board of directors last week postponed any decision on proposals to change the name of the organization in order to reflect the changing character of the aviation business. The board also ruled out a recommendation that its outside public relations firm be retained to develop a new name (AW Aug. 18, p. 23) and asked Hill and Knowlton, Inc., AIA public relations counsel, to propose possible new names for the organization plus give one month for any change at the board's meeting next spring in Washington, D. C.

### Contractors' Costs

Defense Department is still firmly sticking to its Dec. 31 deadline for issuance of a comprehensive set of cost principles for all military contracts, despite opposition by the contractors' industry. More likely, a partial set of the new principles proposals will be issued first, and additional rules step by step.

Trade associations, including the Aircraft Industries Assn., Electronics Industries Assn. and the National Security Industries Assn., are unanimously opposed to all but a few of the cost principles tentatively planned by Defense Department. "They have been in negotiation for some months in a 'hot pot'," industry spokesmen told Patrick McGuire, Assistant Secretary of Defense for Supply and Logistics. But "a complete review of the proposals outstanding are current."

"They also declared that the new principles are of the utmost priority, as they affect the cost recovery and profit potentials of every company engaged in defense contract-

ing—not, as in the past, just those which undertake cost reimbursement type contracts. It made application to cancer contracts to see, without the regulations, as proposed, would actually, revise the basis under which even present contractors agreed to perform his obligations."

The industry spokesmen urged McGuire to confer the Defense directive to a special statement of "policy and principles"—and issue detailed interpretations and instructions to an "industry manual."

### Douglas: More Secrecy

Air Force Secretary James Douglas says he believes in tightening the security checks in military information. "I think we are now acting as if we are in the state of information," Douglas told the House Government Information Subcommittee. "There is no such confusion as Russia."

### Procurement Policy

Kennedy released his developed in legislation that could modernize military procurement policy. The legislation was introduced in Sen. Everett Dirksen (R-Miss.) at the close of that state's congressional session (AW Aug. 15, p. 26). Among its other provisions, the measure would establish "performance" contracts, eliminating detailed specifications and exempt incentive and fixed price contracts from competition. Department of Defense has appointed a task force under Assistant Secretary of Defense Patrick McGuire to make a comprehensive study. National Security Industrial Assn. and U. S. Chamber of Commerce have opposed study groups. The Chamber will consider the proposal at its annual meeting in January.

### Government Plants

House Armed Services Investigative Subcommittee headed by Rep. Edward Brooke will hold hearings Dec. 3 on complaints that the military services are financing private plant facilities for weapons that could be produced in now-closed government-owned facilities. Wherever possible, Frank H. Rogers, Assistant Secretary of the House, Fred A. Berke, Assistant Secretary of Navy, David Sharp, Assistant Secretary of the Air Force for Material, and David Permut, Assistant Secretary of Defense.

### Lobbying Charge

Technique last week by James Larkin, former Civil Aeronautics Board chairman, at a hearing of the House Legislative Oversight Committee, is expected to give a boost to proposed legislation limiting Presidential power of international trade cases in foreign policy and defense considerations. The Senate passed such legislation in the last Congress, despite opposition White House opposition, but the bill died in the House. Although CAB decisions are supposed to be confidential, Larkin told the House group, that they generally become known and that unfair lobbying activities are concentrated on the White House. "No one then knows who was on the White House staff or what evidence is presented."

"The procedure places a premium on lobbying in its worst characteristics."

—Washington staff



# NASA Asks Specific Capsule

**Washington**—Specifications for the National Aeronautics and Space Administration Minuteman-Space capsule are now detailed from its final and extend the contractor to a specific approach.

NASA said it was a deliberate policy in this case though not necessarily a guide as to its future specifications. "There are a lot of ways to skin the particular cat," on NASA spokesman said, but we wanted to find down pretty much what we want.

Proposals are due Dec. 11, a week's postponement from the original date of Dec. 8 (AWN No. 10, p. 27). NASA has not disclosed the unclassified specifications, but AMERICAN WEST has loaned details of the drawings made by NASA as a basis for feasibility studies.

- **Reentry heat sink** is proposed for front heat protection during reentry. Use of an ablative material is considered as an alternate, backup approach.
- **Shell construction** of titanium honeycomb sandwich or, alternatively, a welded aluminum-core shell (possible result of either titanium or stainless steel).
- **Side heat shields** constructed on a 310 in. thick, longitudinally-ripped metal base alloy.
- **Helium tank and nose shielding** from a combination of the outer metal walls and two layers of dual purpose insulate foam.

NASA specifies that the capsule shall have an extruded metal heatshield protecting the maximum reentry surface during and maximum surface heating. It must have no tendency to tumble in re-entry, work up moisture from extreme levels of shock.

The 2,400 lb. capsule is to be fired from Cape Canaveral, Fla., by an Atlas D booster into an orbit about circular. This is to insure as exact control as possible of the landing site. Again, it is to be 120 mi. and payload 115 mi. with maximum eccentricity of .045.

Re-entry is to be initiated by ground control after two orbits, though the capsule is to be capable of up to 15 orbits.

Three solid propellant retro-rockets, mounted on the capsule front ahead of the heat shield, will be fired simultaneously to produce a re-entry angle of 1.1 deg. to the flight path. Retro capsule is to produce a velocity of 500 ft/sec.

A shape parachute, of the ribbon type capable of operating at speeds up to Mach 1.5, will be deployed at 70,000 ft. at a speed at Mach 1. The para-chute will be deployed at 30,000

ft. to produce a landing sink speed of 30 ft/sec.

In the landing sequence the retro-rockets are jettisoned after firing. After the heat sink has jettisoned its mission, it also is dropped from the front face of the capsule and an inflatable landing bag, carried behind the shield, is inflated for actual impact.

Descent of the capsule begins forward during firing and backward in re-entry and landing.

NASA specifies the capsule, for purposes of description, as divided into three sections: a bottom on which the retro-rockets and heat sink are mounted and which supports the internal equipment and which will be subject to water impact in a contemplated sea or earth impact of maximum, a mid-section designed to accommodate an entrance hatch and viewing ports, and a top dome designed to accommodate parachute attachment and means for the solid propellant escape rocket system.

The capsule must be capable of re-tuning.

- **Rigid body acceleration** of 25Gs axially and 4Gs laterally.
- **Water impact** landing at approximately 15G's.
- **Abort mission** loads of a maximum of 75Gs.
- **Internal pressure** on the pressure of 15 psi (Atmospheric pressure).

Beyond being leak resistant after water impact, the capsule must be resistant to catastrophic damage, during as long as the mission after the pressure hull would gross data would be less than 101 for a 28 hr period. Exposure level of 60 mi. of steel is regarded as sufficient for radioactive strike protection.

Temperature difference between the bottom, middle and top sections is anticipated by NASA at 500F. Maximum temperature of each section is to be held through heat shielding to 600F.

NASA insures these heating and temperature ranges for re-entry.

• **Stepdown landing** of the front face at entry angles of 1.1 deg. indicates a descent in long in 500 sec. and maximum landing rates of 50-100 ft/sec.

• **Total heat input** for the front face at about 5,000 Btu/ft<sup>2</sup> is associated with an entry angle of 1 deg. with lower inputs for greater angles.

• **Afterbody radiation** equivalent to the side shields is considered at 1,000-1,500 Btu/ft<sup>2</sup>. Total heat inputs on the side shields will be on the order of 1,000 Btu/ft<sup>2</sup>. For these, the shield heat sink is suggested.

Two levels of analysis are assumed

## Approach

for heat and noise reduction in the capsule interior. NASA estimates 1 ft.<sup>2</sup> of dual purpose insulation should be less than the total heat transmitted to the capsule contents during re-entry to 25 Btu/ft<sup>2</sup> of wall area. The combination of two metal walls and two insulative layers should be capable of providing a 30 db reduction in noise at the quarters of 600 cps.

Visualizing these requirements as hardware might produce a scheme on the order of a steel, probably a space of titanium or stainless steel for the occupant placed inside a cone open at both ends and constructed of the metal heat sink. These two structures are separated by the layers of insulation. At the small end of the cone the parachutes are stored and the safety metal plates extend forward from this. At the large end of the cone the heat sink heat sink is attached, upon which the retro-rockets are mounted.

The landing bag then would be stored between the heat sink and the interior shell.

Reaction jets with one alternative in operation, are specified for the stabilization and control system.

The system are broken down this way:

- **Automatic control system** which is divided into high and low torque modes. The high torque mode is a spin reaction jets, but the low torque mode uses no reaction jets or reaction wheels.
- **Manual control system** usually selected from the pilot's manual or straining position. Mechanical linkages to mechanical valves which control the flow of the reaction jets are specified for the manual system.

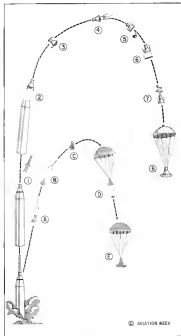
Alignment of the capsule is to be attained in orbit within three minutes after booster separation and the stabilization system is to have an accuracy of plus or minus 0.5 degrees about each of the three axes.

The high torque mode is used for:

- **Decoupling** of residual motion of the capsule after booster burnout and separation.
- **Stabilization** during firing of the retro-rockets.
- **Decoupling** during entry.
- **Prevents** of high torque requirements in case the low torque system becomes inoperative.

The low torque system maintains three-axis control for the balance of the initial and entry phases.

Normal mission call for pre-ignition of the solid propellant escape rockets and prior on which they are mounted five seconds after staging of the launch



**NORMAL FLIGHT** sequence and a part of NASA's Minuteman-Space capsule are shown in this sketch. Numbered sequence shows normal flight, with (1) separation of escape rockets, two seconds after staging; (2) capsule separation from the booster; (3) separation of capsule from retro-rockets; (4) separation of retro-rockets; (5) separation of heat sink and deployment of escape parachute; and (6) decoupling of landing parachute and inflation of landing bag. Later view of heat sink and safety metal plates being the capsule opened and to the side of the booster; (8) escape rocket separation, and (9-12) coming out of the landing sequence described above.

rocket system. Small auxiliary motors are to perform the task.

In launching attitude the escape rockets and gyros are located and the location sensors of the capsule and the sub-rocket are attached, fit onto the top of the Air Force.

Should a launching pad about occur, the rocket system will be used for the safety of the capsule and the sub-rocket. The capsule is to be launched to a maximum height of 2,500 ft. Landing then would take place normally in a recovery.

For landing, recovery will be made in an additional parachute to ease the primary parachute task. The escape parachute will manage a reliable return after reflection and give control of the landing parachute will be alternating radar and atmospheric change for maximum visibility. The capsule is to remain aloft at least 12 hr after landing and be capable of 25 hr in flight.

Capable equipment includes:

- Communications two-way voice, command receiver, ground to vehicle telemetry, vehicle to ground, radio tracking beacon (100 mc, 100-1000 mc, 100-1000 mc) and UHF) and other recovery aids, S and X band beacon for the General Electric guidance system and the rocket firing command system, C-band

radio tracking beacon, tracking by Radio Corp. of America F75-16 radar, GE guidance in adaptation of GIE's Atlas system (A79-19) April 28, p. 74).

• High accuracy digital light system for tracking. A laser and laser battery monitor to monitor in real time is specified.

• Guidance system is specified for the system, one to control the pilot's approach, the other his instrument readings. Carriers also will be provided for guiding the capsule and also, including a 150 deg. horizon picture of the earth.

• Medical measurement electronic gages, respiratory rate and depth, and pulse, body temperature, vision, recording, auditory and physical activity.

Some experiments are planned prior to an orbital shot. These include limited stability tests, tests of the rescue control system, and the life. Selected short tests and conditions are carried out. One example given for first flight of the capsule will be for a firing altitude of 30,000 ft. The capsule, including an attitude gage, will be launched at a distance of 200 mi. One example to the attitude gage specifically in the navigation system NASA usually specifies these still be. No further suggestions.

## Space Technology

# Hypersonic Transport Operating Cost May Be Half That of 707

New York—It may pay to move passengers through the atmosphere at Mach 6 in Mach 25.

Working from what he believes to be attainable conditions, Robert A. Corning of Space Technology Laboratories, Inc., estimates direct costs of hypersonic flight will be 5 cents/passenger mile, with a load factor of 0.5 and 200 lb./passenger, 1 cent/passenger mile.

These costs, Corning pointed out to the American Rocket Society, are less than half the estimated operating costs of the Boeing 737 (10 cents/passenger mile), substantially lower than those achieved by current turbojet aircraft (at \$1.67/passenger mile) and at least competitive with those of most airplanes powered. If they can be obtained, he added, large savings in traffic may increase significantly in a decade.

It probably will be at least 10 years before the first hypersonic transport prototype is built. Even then, the high-altitude acceleration (estimated for the first hypersonic vehicles to be 3-Gs for a duration of 5-10 min.) would make it necessary for passengers to undergo

rigid physicals to weed out people suffering from such things as cardiac trouble and to wear special harnesses during takeoff.

Despite such drawbacks, Corning believes hypersonic flight will prove a financial success. It will cost the passengers less than half the price of a seat on the first U.S. turbulent transport, he says, it has been estimated that an early route, one that the price is set in half, traffic density can be expected to increase by a factor of 30.

Corning's conclusions are based on a study of the influence of various parameters on the flight economics of hypersonic aircraft. He calculates in detail the hypersonic engine, which will create at constant speed, and the boost-glide vehicle.

The boost-glide craft does not now support too promising, but Corning believes the Air Force's Defense Research Agency could turn its information but could change the surface for boost-glide transports. The big drawback now is aerodynamic heating. (When this problem is solved, the boost-glide aircraft might be more economical to oper-

ate than a hypersonic cruise vehicle.) At present, to cover a route of only 3,500 naut. mi., a glide vehicle with a 14-ft/dia. and an 8-ft high, 100,000 lb. flight speed of 16,000 ft/s. Conversions in design required to cope with aerodynamic heating at these speeds could be Corning believes, seriously compromise costs. Corning's cost is a conservative estimate of long-range boost-glide vehicles.

On the other hand, a hypersonic engine that would create a constant speed of 5,000 ft/s would encounter significant hypersonic in air less than one-third those at 16,000 ft/s, and, hence, could use lightweight refractory materials that would not be so brittle at the higher speeds. Such use in the engine, or in aerodynamic heating, would be both feasible and economical, he maintains.

In his discussion of the economics of a hypersonic cruise vehicle, Corning cites overhead costs and considers only direct flying costs. Although overhead estimates roughly 45% of total operating costs, he says, it is comparatively insensitive to operational characteristics of the aircraft. As a result, they are of special interest to the designer, the manufacturer and to the operator of commercial aircraft.

Corning divides direct flying costs into fuel costs and structural costs. Structural costs include interest on invested capital, depreciation and maintenance, repair and replacement, and insurance and losses on replacement. He makes a constant difference of 0.5 cents/passenger for interest of flying programs, which he believes will be a constant cost for all types and also indirectly insensitive to changes in design parameters. Corning also makes an allowance of several hundred miles for the length of the glide path a hypersonic vehicle will need for deceleration prior to landing but does not consider distance subtracted at less than 300 mi. required to boost the hypersonic engine in cruise speed.

The six technical parameters which most affect the direct flying costs styling are:

- Thrust cost of propellants and fuel
- Specific impulse or specific heat combustion
- Aerodynamic properties of the vehicle, especially the lifting area.
- Unit cost, including engine and maintenance, of the vehicle's dead weight structure
- Depreciation factor, i.e., the number of flights the vehicle can make before it is worn out or becomes obsolete.
- Aircraft at payload that can be de-

livered per unit area of vehicle cross section.

The first parameter, Corning points out, affects only fuel cost, the next two, fuel cost and structure cost, and the last three, just structure cost.

To compute direct flying costs for different hypersonic vehicle configurations, Corning assigned representative numerical values to the six cost determining parameters, beginning with a consideration of the cruise phase.

For unit costs of propellants and fuel, he chose a reference model propellant combination of petroleum-based fuel and liquid oxygen which at 14,000 ft/s in large-scale use would be nearly cheaper than any other chemical propellant with comparable specific impulse. Liquid hydrogen, he said, is expected to cost at least 10¢/lb. Gasoline at 10¢/lb. and 2¢/lb. is used as the reference for liquid and rocket fuels.

Three types of propellants are considered in regard to their use as a specific fuel consumption, chemical fuels, as burning engines and nuclear systems. The reference specific impulse for the chemical fuel is set at 340 lb./lb. of fuel.

Taking 0.950 ft/s, as the top mass paid for fuels having subsonic combustion chambers, Corning assumes the thermal efficiency for a cruise at the speed of over 8,000 ft/s. If it had such to produce with a heat of combustion of 16,000 Btu/lb. were used as the correct, the specific impulse would be 1,740 lb./lb. of fuel, or four times that of the reference model propellant. And the fuel costs per lb. of impulse of a model flying at 6,000 ft/s would be about half those of the model.

All the lower flight speeds of the cruise phase, a hypersonic specific fuel consumption of 1.9 Btu/lb./ft/s. of sea level static thrust would have an equivalent specific impulse of 1,600 lb./lb. of fuel. Thus, Corning assumes the development of hypersonic turbo-jet engines, which will have high thrust-to-weight ratios and specific impulses several times those of straight chemical rockets.

At liquid hydrogen with a heat of combustion of more than 80,000 Btu/lb. were used instead of gasoline in the subsonic engine, specific impulse would be further increased by a factor of one more than 21. At present, however, the higher cost of the liquid hydrogen would offset the gain.

Going to a solid-core nuclear reactor using hydrogen as the working fluid, Corning believes it will be possible to obtain specific impulses of 1,200 lb./lb. of fuel.

Used in a single or turbojet with air as the working medium, the solid-core reactor will have volume and weight but specific impulse and fuel cost will be low. But here, too, the consumption

of fuel will be high, and the weight of the fuel will be high. At 100/1, have been proposed Corning believes development of practical air-breathing hypersonic jet engines will require at least a 200/1 thrust/weight ratio of 0.0075. Attainment of either objective would help reduce booster costs, which are a considerable part of the total cost.

| Hypersonic Specs  |                 |
|---|-----------------|
| Possible specifications for a representative hypersonic aircraft as outlined by Robert A. Corning |                 |
| Range   | 3,000 naut. mi. |
| Cruise propellant (chemical)  | hydrocarbon     |
| Specific impulse (lb./lb. of fuel)  | 1,240           |
| Flight speed (ft/s)   | 6,000           |
| Altitude  | 60,000 ft       |
| Structural cost   | 0.1             |
| Engine cost of 100/1 Btu/lb.  | 1.2             |
| Cost of 2¢/lb. of propellant at 14,000 ft/s   | 0.5             |
| Booster   | 0.1             |
| Thrust at 6,000 ft/s  | 1.0             |
| Thrust at 14,000 ft/s   | 1.0             |
| Load (lb./sq. in. area)   | 0.5             |
| Total direct flying cost  | 1.2             |
| Cost/passenger mile   | 1.2             |

becomes a major matter compared with the weight of the heavy components and shielding required in a nuclear-powered transport.

A 100-ton unit of air is set by Corning as the hypersonic cruise engine at 6,000, 10,000 or 10,000 ft/s.

The direct cost of a contemporary jet engine, which has an empty net weight of 100,000 lb., is approximately \$1 million. This amounts to a unit cost of \$75/ft. Based on a projected life of 10,000 hr, the depreciation and maintenance costs work out to \$8,000/ft. hr. Maintenance, repair, interest and loss on replacement are now assumed to \$100/ft. hr. The total cost then for the flight structure of a contemporary jet aircraft is approximately \$915/ft. hr. or \$500/ft. hr. plus \$100/ft. hr. for maintenance.

Unit structural costs of future hypersonic aircraft will be more, perhaps \$6,000/ft. hr. It may cost \$100/ft. hr. to achieve a hypersonic vehicle (including booster) which is likely to have a service life of only 2,000 flight hours at a unit of the greater stress on the structural elements. Another \$500/ft. hr. may be required for maintenance, repair and interest.

This amounts to \$100/ft. hr. over a 2,000 hr. life.

The structural factor-of-safety of composite materials of a wing in its initial cruise phase, the hypersonic aircraft cost in the report are 0.1 and 0.2 for payload stages and 0.05 and 0.1 for boosters. For contemporary transports, the factor is about 0.5.

As hypersonic boosters, Corning assumes such booster will be recovered and reused and that the flight time for a flight duty time of about 30 hr/day and will have 30 units available for each flight. Corning estimates 20 vehicles will be required to handle intercontinental traffic and 30 for intercontinental.

Economic advantages of hypersonic flight, Corning says, appear to favor the large operator. While many companies will be required to build and maintain to operate, several vehicles are desirable to allow for time-consuming maintenance. Moreover, the larger company will have greater traffic flexibility.

It is in such a position that a hypersonic aircraft can handle all traffic on a given route, there will be no need for a few companies to profit.

## Carmichael Promoted In Fairchild Shift

Hagerston, Md.—James H. Carmichael has been named executive vice president of Fairchild Engine & Airplane Corp. on the latest of a series of reorganizational changes, naming up from vice president of the General Electric Corp. to Fairchild.

Carmichael, former president and board chairman of Capital Aircraft, will continue to head the Commercial Transport Division, according to Fairchild officials. He replaced S. Roy Cole. Carmichael joined the company early in September.

The board of directors last week also elected F. S. Bennett Jr., controller, as vice president. Bennett was promoted to the responsibilities of F. E. Nebel, Jr., vice president-coordination of planning, to include marketing and engineering.

In another move, William G. Key will return to public relations director after a year's absence from the company during which he served as administrative assistant to Vice President Richard M. Key.

During Key's absence, the company's public relations program has been directed by Lou Davis, assistant to the president. Although plans are not yet made, Davis will continue to direct the company's promotional program for its F-27 turboprop transport.



## Tight Fiscal 1960 Budget Plans May Force IRBM Cutbacks

Washington—Final decisions on the fate of the Titan and Jupiter intercontinental missile programs and on the National Aerospace and Space Administration's bid to take over the space activities of the Army Ballistic Missile Agency probably will be made during the next few days.

These schedules for the decision, plus indications that tight Fiscal 1960 budget policies will force cutbacks in several missile programs, were made by Defense Secretary Neil H. McElroy. At his first press conference since returning from a five-week tour of the Eastern defense installations, McElroy said that either the Titan or Jupiter programs, or possibly both, will be killed after the limited number of missiles now on order have been completed. He said: "We might not have the requirement for the number of either one of these, or at both of these missiles, that we have been talking about up to this point."

A spokesman in McElroy's office said he felt that the Defense Department had "been thinking of heavy deployment of IRBMs" but that now, "we have been able to reduce our estimates."

Both McElroy and his spokesmen attributed the reconsideration to the fact that, in Fiscal 1960, "size emphasis will be placed upon the intercontinental ballistic missile (ICBM) and."

"The father son go down the road toward the operational capability of the ICBM, the less attractiveness it has to deploy additional... IRBMs, and we are coming closer to the state of operational capability of the Atlas."

The Defense Department spokesmen later agreed that, in referring to an operational ICBM, McElroy was "talking quite a number of years ahead."

Two primary factors behind the decision to cut procurement of intermediate range ballistic missiles are the Administration's decision to try and hold the line on defense spending and the fact that only two North Atlantic Treaty Organization countries have agreed to accept the \$300 million Atlas. Four signatories are scheduled for Great Britain, two Japanese squadrons for Italy.

The U. S. commitments in England and Italy will be moved out, McElroy said, "regardless of what the decision is as between Titan and Jupiter because these have already been ordered and are being produced."

In discussing the 1960 budget, which is under preparation, McElroy said the three services have been told to re-evaluate their requests within the

fringe limits of their Fiscal 1959 budget, although he added that this was not to be regarded as a rigid ceiling.

He disclosed, however, in reply to earlier predictions that next year's budget will be slightly higher than that for Fiscal 1959 and said the Defense Department hopes "to lay off some marginal programs to reduce them."

"If we can, then I would also hope that we could take some promising programs and accelerate them," McElroy said. "I know that's going to meet and to tell I can't say. But I don't believe that the President wants us to do what he is to say best to make a better case for our defense program."

Asked again, the President will have his own decision as to what he wants to support in his proposal to Congress.

Asked, "I'm sure that he [the President] will not cut our arms budgeting this year in some detail,"

McElroy said, "the 'inspired program' of McElroy and his spokesman said that, in Fiscal 1960, 'size emphasis will be placed upon the intercontinental ballistic missile (ICBM) and...'

Other than the intermediate range ballistic missile, McElroy failed to specify any other missile programs that face cutbacks, although other reports, particularly in the air-trust field, have failed to say in effect to build the Fiscal 1960 budget as follows:

The Defense Secretary also said he

### AIA Election

Plethora—Arthur, Indiana, Assoc. board of governors elected the following members in election of the association for 1959 at its annual meeting last week.

• Chairman—C. J. McGuffey, board chairman of Chrysler Vought Aircraft Inc., Indianapolis. George H. Bunker, chairman of the Airline Co., Chicago.

• Vice Chairman—D. C. Ramsey.

• President—O. B. Cook.

• Vice President—J. S. McDowell Jr., president of Lockheed Aircraft Corp.

• Vice President—C. D. Wood.

• Secretary—James Sherman Brand, Jr.

• Elected to the association's executive committee were William M. Allen, Boeing Airplane Co., Renton, W. A. Swartz, Government Aircraft, St. Louis.

• President, Cook, Ramsey, McGuffey and McDowell.

helps the requirements for intermediate range missiles can be reduced in 1960 by the deployment of intercontinental missiles and asked again for confirmation of the fact that the President will be asked to support the year. On intermediate missile, he said:

"Now, I don't see the intermediate missile for some time replacing the intermediate range missile, but I think that it is realistic to expect that there would be a reduced requirement for intermediate in we get our intermediate missile in place."

So far, no additional article is received, McElroy and the Joint Chiefs of Staff, after repeated queries, have determined that additional missile has "relatively low priority."

## Possible Defense Cuts Warned by AIA Head

Washington—Aircraft industry was warned last week to expect continued controls on total defense expenditures, continuation of Defense Department policy of spending by fiscal quarters and a possible reduction in programs to keep within prescribed limits.

Oval B. Cook, president of the Aircraft Industries Assn., warned in his annual report that the outlook for the coming year may not be as optimistic as the lightness situation that arose in the latter part of 1957. At that time, cutbacks, shortfalls and cancellations of programs were ordered by the Eisenhower administration in an effort to reduce defense spending and keep within the prescribed national debt limit.

Cook, speaking at the AIA board of governors meeting in Phoenix, said that the industry, although other reports, thought that defense expenditures will be increased to an large degree in Fiscal 1960 already has been expelled by the military service.

The overall industry, he said, will do everything possible to cooperate with the services in keeping costs down and expenditures within planned limits. He added, however, that the complexity of developing and producing modern weapons, plus the need for new scientific breakthroughs, are not always consistent to a strict money-by-the-month cost-reduction approach.

At a trial of changing demands in military requirements and cutbacks and cancellations of contracts, industry employment has declined from 92,000 in July 1957 to 741,000 last is expected to drop to about 750,000 by the next annual meeting, Cook said.

Cook also said the Defense Department policy in which program proposals were reduced, requiring a greater reduction by individual companies, has forced a number of major prime contractors to make extremely large losses in the private capital.

## Space Technology

# Sentry Satellite Shot Planned for Dec. 15

Washington—First U. S. reconnaissance satellite, Air Force's WS-117L Sentry, will be launched into orbit from Vandenberg AFB, Calif., on Dec. 15, according to the present schedule. A follow-up Sentry shot may be fired about two weeks later.

While the initial Sentry firing will be the first U. S. attempt to scan the globe with a camera eye, the Russians already may have put a reconnaissance satellite into high orbit.

On Sept. 23, a 4000-mph. signal, on two frequencies used by the Soviets, was picked up at the Air Force Missile Test Center, Cape Canaveral, Fla., and heard for at least three hours (AW Oct. 27, p. 23). No U. S. aerial vehicle has been seen with this particular frequency.

To be heard for this length of time, the signal could have been sent from a satellite orbiting in the same direction of the earth's rotation, and at approximately the same speed, at an altitude of about 22,000 mi., allowing an opportunity to view the planet with a ground equipment. Another possibility is that the signal may have been sent from a Soviet launch probe, with the mission facing the U. S. for a considerable time.

### Sentry Timetable

Timetable for the Sentry, a Lockheed Missile Systems Division project under contract to the Air Force, follows: Missile Division, has factored as a result of lack of adequate financial support and because of the difficulties encountered. First shot was not expected until late next year, but the delay has been provided to attribute the project. Also, work on facilities at Vandenberg has been speeded considerably.

Highlights of the first Sentry firing include:

• Shot will be made from one of two Titan intermediate range ballistic missiles now positively scheduled at Vandenberg. Manufacturer, work on the WS-117L, will be used to accommodate an Atlas intermediate range ballistic missile in the booster, is being pushed to completion for alternate Sentry firing.

• Douglas, that intermediate range ballistic missile in a booster, equipped with a Navy Polaris IRBM second-stage solid propellant rocket, will be used to push the payload into orbitally low altitude.

• Polaris, that intermediate range ballistic missile in a booster, equipped with a Navy Polaris IRBM second-stage solid propellant rocket, will be used to push the payload into orbitally low altitude.

at Santa Rosa, Calif., where the test stand was damaged by blast.

• Payload, weighing between 400-450 lb. for the first Sentry shot, will consist of a synchro-scope telescope camera associated, infraredly equipment, with provision for scanning the satellite, so that it can constantly view the earth. This payload, a rough sketch of original projections, will be the first in a series of several arrangements expected to enhance increasingly increasing accuracy of information.

### Scanning Systems

The latest, more sophisticated version of the Sentry will use other scanning systems, including attitude and vibration hypercontrol. One scheme involves using a scanning device in a dumbbell-like cross-coupled (AW Jan. 23, p. 18), but the details of this configuration are not available for the December firing.

Success of this first firing and subsequent shots probably will have a pronounced effect upon the amount of financial support that will be awarded only the Sentry project. Lockheed, as well as Air Force planners, hopes to reduce the Sentry order over a long period of potential development in being not only highly efficient reconnaissance satellite.

• Orbit aimed for will be 100-mi. circular north-south path, providing an

opportunity to view the entire surface of the globe as it rotates beneath the satellite.

• Time in orbit probably will be very brief, perhaps not more than eight to 10 hours around the earth, after which the satellite will reenter the earth's atmosphere and burn up, when its recovery features are incorporated in this first Sentry payload.

• Telemetry signal will be on an isosynchronous basis, that projected for use may be viewed and data related to ground stations.

• Tracking will involve stations in Alaska and Hawaii, as well as a sky station positioned about 950 mi. and down range.

• All equipment, with exception of Titan and Polaris second stage, is being assembled at Lockheed Missile Systems Division's Palo Alto facility and will be shipped from there to the Vandenberg site in time to meet the December firing date.

• Missile Systems Division Weapons Systems Manager, J. H. (Jack) Carter, Lockheed's lead coordinator of the project, having spearheaded the work on the Sentry in direct since its inception. • While the Sentry is the overall design for the WS-117L project, the Air Force probably will designate each shot with an individual operational name.

## Aerodyne Plans Solid Propellant Push

Aerodyne, Inc., a major producer of retailed, solid propellant gas-actuated missiles, is preparing to develop a cost propellant production capability that it believes will be equivalent to any in the field, which is now dominated by Aerojet-General Corp. and Thiokol Chemical Corp.

In a result of the growing reliance on NATO units and the rapidly decreasing NATO expenditures, Aerodyne does not expect to produce the extended solid missile after the end of next year. The company has already started to convert twelve IRBM missiles formerly used in the production of retailed propellants, whose the backbone of the retailed propellant has proved among others, to the lower power requirements of the same liquid and solid.

In addition, the firm, Aerodyne already has two IRBM and propellant systems in a production and one 2500-lb. unit on order.

Moving rapidly in the key to solid propellant production capability, according to John Toney, Aerodyne's director of engineering and development. The equipment needed to actually cast the solid grains is completely different from the drying cans used in the production of other type of solid propellant.

Although Aerodyne has avoided solid grain use up to 1954, in diameter, this is considered to be about the limit its extended propellant grains. Cost propellants already appear to have the edge when grains of greater size are called for.

Now, 240 250-lb. units will be used in the limited, specific application for the retailed solid propellant of other type. When this solid specific application is over this point, they are not likely to enable the military materials in use before. And the development of the new high energy solid propellant is expected to require major technological advances that may have to start almost from the beginning with basic research in the physical sciences.

# President Backs Air Force in GAO Battle

By Katherine Johnson

Washington—An Air Force tug-of-war with the General Accounting Office over release of its report entitled "Barriers to Management of the Ballistic Missile Program" (AW Nov. 17, p. 34) resulted in a delicate last week.

President Eisenhower looked at Air Force Secretary James H. Douglas Jr. to be asked to release the entire report out side the Air Force. "In my opinion," the President wrote Rep. Clare Hoffman (D-Mich.) "the public interest is not necessarily served by divulging the advice, suggestions or recommendations which administrative employees periodically make to their superiors."

Rep. John Moss (D-Calif.), chairman of the House Government Information Subcommittee, will continue to

push for the report's release. He will seek the cooperation of Rep. Carl Albert (D-Col.), chairman of the Armed Services Committee, Rep. George Melson (D-Tex.), chairman of the Appropriations Subcommittee on the Armed Services, and other congressional leaders. Moss threatened to offer an amendment to USAF's budget for next year requiring release of the report to the General Accounting Office.

USAF, after considerable prodding did turn over to GAO a 35-page "statement of facts" drawn from the full report. GAO says it wants the full report, not only to read it in its own comprehensive investigation of "all administrative aspects" of the ballistic missile program but also to evaluate Air Force's system of self-inspection by the Inspector General's organization.

The report is viewed as a "show down" case. It is the first of a series of USAF Inspector General reports wanted by the General Accounting Office. Other investigations on the agenda of the Inspector General for the July-December period include: "Barriers to Management of the Ballistic Missile Program," which reports GAO findings; • Advertising versus capabilities in procurement; • Quantitative and qualitative changes in procurement program; • Contract cost overruns; • Maintenance and modification programs; • Electronic data processing systems.

Conceptualized by Joseph G. Campbell, reported that GAO is overlooking its investigation activities "in such vital matters as modern weapon systems and the determination of requirements with special attention to increasing cost and those such as jet engines and missiles. "Our primary objective," he told the Moss subcommittee, "is to determine how effective these programs are in supporting the accomplishment of the military mission involved, as well as how efficiently and economically they are carried out." Several investigations of Air Force research and development projects already are under way.

The Air Force made the investigation of its ballistic missile program from Jan. 14 to Feb. 21 on the recommendations of Lt. Gen. S. B. Anderson, vice commander of the Air Research and Development Command. Here are the key findings from the summary submitted by USAF to General Accounting Office.

• The concept of management adopted for the ballistic missile program had proved sound. In the development and test area, important advantages were gained because the Ballistic Missile Development Command held management responsibility for all weapon systems of the ballistic missile program. These test strong evidence that this concept of management and the professional political status possessed by the missile-research development group must be continued to assure success in achieving Air Force research objectives.

• "The Air Force was committed to a continuation of its dependency upon the Ramo-Woodbridge Corp. for technical know-how in the management of the ballistic missile program in the absence of an Air Force technical capability. The future role of the R/W Corp. involved uncertainty because of its expressed desire to participate in the competition for ballistic missile hardware contracts."

• "Full benefit of second Air Staff action in the ballistic missile program has

not been obtained. This deficiency was attributed to time limitations imposed upon the review process. However, in large measure, this deficiency could be more properly attributed to failure of Air Staff agencies to perform effective liaison with the RMD complex."

• "At no time had there been a block, entered to the Air Force to support an unbalanced ballistic missile program. The policy of noncommitment involving the ballistic missile program had been in effect."

• "The purchasing practices of contractors were not consistent with acceptable Air Force standards. As a result, delays and expense costs were being incurred. Air Force cost control was difficult because of contractor designed for approval Air Force procedures, lack of capability and time and persistence of the program."

• "The practice of contracting with the R/W Corp. for many administrative support services without exploring the cost of alternative sources had not been adopted."

• "Contract of R/W was held, through a 18-month rolling bid agreement, by S. Ramo, D. E. Woodbridge and H. L. Goetz, notwithstanding the interest of Thompson Products, Inc., as principal stockholder and supplier. That the Air Force would continue to deal at least until 1964 with the individuals who were the basis for the original source selection." James Woodbridge and Thompson Products were recently acquired (AW Aug. 13 p. 24).

## North American Sales Drop in Fiscal Year

New York—North American Aviation Corp. reported a drop in sales for its fiscal year ended Sept. 18 to \$964,879, 81% compared with \$1,315,761, 96% the year before. It was the third highest sales volume in North America's history.

Net income declined from \$31,264, 46% to \$4,122 as shown last year to \$36,786, 19% or 33.3% share increase of net income of new government orders, such as the B-70 chemical bomber, and re-evaluation of orders. North America's sales were 30% higher than the company income.

Other company reports:

• Commonwealth Engineering Corp. reported a steep decline in sales during the fiscal year because of work on the California contractor's transport. These amounted to \$1,900,000 compared with \$2,150,000 last year. Nine months sales exceeded those of last year—\$163,885,454 compared with \$147,442,831. But company's 1963 sales \$1,383,705, last year to \$1,318,807, this year.

• Fairchild Dage and Airplane Corp. reported a nine-month loss of \$4,768, 066 because of F-77 waste oil costs. The company said that although it has lost out the loss figure from \$5,000,000 reported at mid-year. These credits, amounting to \$4,521,000, offset an operating loss of \$9,111,800. Total sales for the period were \$397,407,000.

## Three British Lines Planning to Merge

London—Three British independent airlines, Newcast, Transair and Air Charter, plan to integrate completely next year with formation of a new company. Air Charter will merge with the Furness Withy and Blue Star shipping companies, own Transair and holds a major interest in Air Charter. Group owns 45 aircraft including one Bristol Britannia and five Vulcan bombers—making it the largest independent airline operation in Britain.

When fully integrated, Airways Inc., the airline will mean operating from Birmingham Airport, headquarters at Gatwick and Scotland.

## News Digest

Leorning Division of Aero Manufacturing Corp. has secured a \$2,254,000 order for more than 1,000 power engines, from Piper Aircraft Corp. Engines are the 600 hp. Leorning OX10 B for the two-engine Piper Aztec, and the 250 hp. OX50 which powers the single-engine Comanche.

Hughes Aircraft Co., El Segundo, Calif., has secured a \$162,35,460 contract from Air Force for production of aircraft and a major control system for the Convair F-106 all weather jet fighter. In another Air Force action North American Aviation has secured a \$6,899,960 contract from Air National Command for research in super-

sonic environment for Phase 3 development of the B70 aircraft.

First Flight of Kaman Aircraft Corp.'s new 1543rd small rocket helicopter, powered by a Lycoming T55 jet turbine engine was made in Bloomfield, Conn., last week when the company started ground acceptance tests.

Air Force Atlas intercontinental ballistics missile tested 1,100 mi. in a five-minute flight last week, after the 44th Essay of the intercontinental ballistics missile from Air Force Missile Test Center, Cape Canaveral, Fla. The flight, a probe to an attempt at full range, 6,000 mi. launch, marked the longest flight made by an Atlas with help from Centaur in June, 1957.

North American Aviation has secured a \$18.5 million production contract from Air National Command for its B-52G (GAM-77) as its first order for the Boeing B-52G intercontinental bomber. Contract was the first production order in the B-52G program.

Bids are due this week for Air Force's new airborne early warning (AEW) aircraft competition, with proposals expected from Boeing, Convair, Douglas, Lockheed and possibly others (AW Nov. 17, p. 23, Oct. 28, p. 23). General Electric, which is serious about making for Douglas, also reportedly is working on a B-52G, as well as radar, software system for its proposal. New AEW program will have a seriously heavy weapons content.

Leorning Vanguard satellite significantly reduced in size December has been postponed until after the first of the year by the National Aeronautics and Space Administration. Reason for delay is the timing until after the end of an international Geostationary Year to study the Vanguard satellite in accordance with the findings of a feasibility study now in progress.



Technicians Ready Jupiter Nose Cone

Operational nose cone for Jupiter intercontinental range ballistic missile is prepared for loading at Cape Canaveral, Fla. Developed by Army's Ballistic Missile Agency and produced by Chrysler for Air Force use, Jupiter is first stage of Army's missile system.

## Sud Triple-Turbine Helicopter

Four-foot Aviatik is developing a triple-turbine helicopter designed to carry at least 15 persons under all-weather conditions. Prototype in flight this November. Tests 2000 hours, 350 chp. test. First flight is scheduled for the end of January.

Sud engineers have declined to discuss the triple turbine helicopter configurations except to say that it is of intermediate size. The triple turbines are mounted in a single unit and the aircraft operates with each engine rated up with only two turbines in use. Dual controls are installed and pressure is being made for automatic pilot device.

The helicopter development was in a with negotiation between Sud Aviation and Republic Aviation Corp. toward close collaboration on products manufactured by the companies. Republic now manufactures and markets the Sud Alouette replacement helicopter and has been showing the Sud triple-turbine helicopter to U.S. military and commercial organizations.

## Eastern Faces 'Third-Crewman' Strike

**Flight engineers' union threatens walkout if Eastern requires engineers to be pilot-qualified for jets.**

By Gina Corbin

New York—Eastern Airlines last week faced the possibility of the industry's first strike over the controversial third-crewman rule which has cast a long, chilling shadow over hopes for the U. S. jet age.

The airline has reacted "as new as cold" with its pilots concerning turbine plane operations, and Eastern pilots are now sidestepping flight training in the airline's newly delivered Lockheed L-1011 tri-jets. Flight Engineers International, AEA, responded with warning of a two-week strike if the agreement is substantiated.

Eastern's position is the thorniest question in that its engineers will be required to take pilot training to serve as its turbine aircraft, but crew on the Electras will maintain their status quo, that is, flight engineers will not be required to be pilot-qualified. This position is in accord with Federal Aviation Board recommendations announced last August after hearings on stalled negotiations between Eastern and its engineers and pilots.

A new contract between Eastern and its Air Line Pilots Assn. members was signed Aug. 12, covering all terms of employment except that the pilots refused the third crew man for further negotiation. Agreement between Eastern and the pilots on this issue was reached Nov. 13. It is not, however, a part of the latest contract but a separate agreement.

National Airlines pilots and engineers, meanwhile, last week went ahead with general and flight training in Pan American World Airways 707-121s while National pilot in operation between New York and Miami met mostly under a new assignment.

National signed contracts last January with both its pilots and engineers, good until January, 1968. In the event of the introduction of turbine aircraft on National's routes during the contract term, however, it was stipulated that the contracts could be renegotiated to discuss working conditions connected with the jets and turbojets. At that time jet pilots weren't expected in National operations until 1968, but the Boeing 747 did change the picture.

The pilot's contract with National has been accepted under this clause, and discussions are being held. Third

crew men as yet being passed at this point, apparently because airlines want to attract experienced pilots who are going to be needed. The engineers have not accepted their contract and can not raise the qualification issue unless their hired in force.

National understandably does not want to discuss the situation at all. ALPA, however, feels it has delicate matters that the airline's management has agreed to discuss with the pilot problem. Most of the airline's flight engineers are pilot-qualified.

### Industry Pattern?

Another possible reason why National's pilot's contract is so important is that Eastern's case may set an industry pattern.

Pan American refuses to operate its transatlantic jet service with 50 co-pilots pilots down from its engine review. Airline believes it can go ahead on this basis for some time if need be, but has now announced increased New York to Los Angeles service beginning Nov. 27. Daily schedules continue to Paris and Rome.

In drawing on its experience to this extent, however, the airline is seeking to keep its case separate from when and if the issue is finally settled, now have to not schedule impossible to catch up. The pilots, living up to the legal 80 hr a month, won't find time for training after pilots.

American Airlines and ALPA have scheduled a meeting Nov. 26 to try and achieve their bogged-down contract. Meeting was called by the airline, though American has agreed to a contract with the flight engineers. A block to collective bargaining between the parties in its case with the pilots, which has also been before an emergency board, but been the question of whether pilots and jet agreements are to be made separately, as the union wants, or as one package, as the airline wants.

American has scheduled its first work that its Electras would go into scheduled service Jan. 23, with its Boeing 707-120s assigned two days later on Jan. 25. These plans are a revision of earlier announcements that the airline starting Jan. 13 with Electras service following by a few weeks.

Initial Electra service will be be-

tween New York and Chicago on a six day round-trip basis, without scheduled time 2 hr, 5 min. Turbojet flights will be inaugurated between New York and Detroit in February, and to other cities within the next few months.

The 707-120s will be scheduled daily between New York and Los Angeles, scheduled times 4 hr by air, 5 hr by land. By mid-1969, the six day round-trip will be serving San Francisco, Chicago, Washington, Baltimore, Dallas and Boston with its turbojets.

Eastern, in a letter sent Nov. 14 to all its flight engineers, advised them that their had been "unacceptable and undesirable" in the extent of possible results of its flight engineer jet training program. Nothing could be further from the truth, the engineers were advised, that report that the company was giving the flight engineer's job to the pilots.

Under the program, engineers who were turbine pilots would be required to take pilot training on their own time, but Eastern's engineers. Answering the question "Does this decision of the company amount to adoption of the ALPA program?" Eastern stated its engineers, "Definitely not." Chicago was given the same answer pointed out, called by pilot engineers on turbojets as well as turbine engines. All through emergency board hearings, Eastern said, it issued this position and the Board was aware of it.

The program will not allow ALPA to take over jurisdiction of the flight engineers, Eastern promised, because the company will continue to deal with the certified bargaining representative of the engineers, as required by law. No change will occur, the airline said, unless engineers vote for it.

## Arbiters File Award On Western Dispute

Los Angeles—An arbitration award which calls for a pilot pay and a three-week contract, has been filed in U. S. District Court here, ending a year-long dispute between Western Air Lines and the Air Line Pilots Assn.

Award was scheduled to the court by William E. Sanders, arbitration board chairman, although a dissenting opinion was filed by the Western-appointed member, who objected to female wage rates previously set by the arbitrator.

Some conditions of the award are: • **Duration.** A five-year contract, effective to Oct. 1, 1973, and extending

to and including Oct. 1, 1969. • **Wages.** Pilot wage rates were fixed for the period Oct. 1, 1973, to March 1, 1975. Under the award, Douglas DC-8-63 engines with seven crew or more will receive \$1,597 a month for a maximum of 85 hours work. On March 1, the rate will be increased to \$1,571 a month. The previous wage was \$1,499.

• **Maximum Rights.** The arbitration board, granted the pilots previous pay of \$1.00 on base for captains and approximately \$1.50 on base for first officers for doing the 1,735 hrs. route.

•  **Duty Time.** Pilots were guaranteed one hour of flight pay for each two and one-half hours of duty time beginning next June 1, and were annual company guaranteed to build on for cash four hours of duty time effective Jan. 1, 1969.

## Smathers Asks Probe Of Jet Investments

Washington—Sen. George Smathers (D-Fla.) last week urged that the airline industry, in investing \$5 billion a year in jet aircraft, may be "unhelpful" than financial distress to a point where the government will ultimately be asked to pick up the tab.

Smathers declared that the airlines "may be passing a probe of 'keeping up with the Joneses' in their massive purchase of jet equipment when it seems appropriate to look at the industry's need for the public good." He called for a congressional investigation to determine whether the airlines' jet investment "in sound or whether it constitutes a hidden plunge into financial and economic disaster."

Air Transport Assn. said it would "welcome" the investigation. Pointing out that Soviet civil jet aircraft "have been in regular service for some time," ATA declared that "the airlines believe their privately financed jet equipment program is very much in the national interest" and called for the recognition of "a mass government-subsidized aircraft."

Smathers said that the investigation should include "a thorough review of the economic and financial policies of the industry, including regulatory policies of the Civil Aeronautics Board and other governmental agencies, the adequacy of the industry's existing equipment to service the public, the disposition of government-owned airports, and the proper role of the federal government in the airline industry, the function of cargo carriers and freight forwarders and the adequacy and needs of existing airport and airport facilities to cope with the problems involved in the industry."

Some conditions of the award are: • **Duration.** A five-year contract, effective to Oct. 1, 1973, and extending

## Capital, IAM Reach Agreement

Washington—Capital Airlines' president David H. Baker and top union leaders reached an agreement late last week that was expected to settle a five-week mechanical strike and bring about full assumption of the airline's service by Wednesday.

The carrier planned to restore its service immediately after ratification of the agreement by members of the local chapter of the International Assn. of Machinists. An affiliation vote, at its period, would give the mechanics a 41 cent increase in wages over a three year period. The union agreed to return to the work in Newark, N.J., and its chapter of International Assn. of Machinists.

The Capital strike also led to a national and past agreed to its wage increase and designed to provide some financial protection to carriers grounded by an engine strike (AW Nov. 10, p. 48). Last week, the Supplemental Air Carrier Conference asked the Civil Aeronautics Board to order against the post on grounds that the agreement violates "one part strike order" subject to the public interest.

Under the pact, signed Oct. 16 in American, Capital Airlines, Pan American, Trans World Airlines and United, an estimated \$100,000 was donated to Capital. At least three airlines voluntarily returned the post and destroyed in its daily wide strike of CAB approval. Under the terms of the agreement

Capital's Capital Airlines with the union heads Capital was a three-year contract and the right to operate its maintenance and overhaul shops on a seven-day week, less rather than the five-day week called for in previous contracts.

Crucial agreements were established to follow a first priority and shop functions will be permitted to return their services when the local union local and authorized to close their business they remained on the job during the strike.

The Capital mechanics were a 41 cent increase in wages over a three year period. Of the 41 cents, 15 cents will be withheld to October, 1973. An additional 15 cents is effective in October, 1973, and the final eight cents increase will start December, 1973.

The Northeast dispute with IAM was settled without a strike, but TWA mechanics last week appeared prepared to strike for higher wages. However, union leaders here were confident further strikes would be avoided as a result of the settlements reached by Northwest and Capital.

Supplemental coverage, in their protest to the Civil Aeronautics Board, argued that mechanical strikes could still result in a strike by the airlines. The pilots to the one striking pilot and strip airports. Such a strike, they fear, would result in an important road block to the supplemental carrier's handling of traffic generated by a strike.



**American Installs Jet Handling Equipment**

Ground handling equipment for American Airlines' Boeing 707-121 jet is installed in Los Angeles at Lemo Field, Dallas, Texas. Units, costing a total of \$66,655, include an air compressor unit (foreground), and, from left center rear, a battery unit, low tension and auxiliary power unit. At rear is a pump compressor. Not shown is a mobile passenger ramp.

# Iranian Line Gains Solid Financial Status

By L. L. Dety

Tehran—Iran's place in the field of international commercial aviation began earlier upon the Imperial backing and could siting of one man-a-fewer statement whose airline operations began only after he decided to organize Iranian Airways 12 years ago.

Reza Afshar, whose government soon indicated Iran to be president of the Iranian parliament and as a member of the Shah's cabinet, left himself in the company's rank as president and managing director of the airline. He also is owner of every share of the company's outstanding stock. And, at 72, he is ready to pour money into the airline he founded, with 100,000 shares of \$100 each which he gained by outmaneuvering the Russian government.

That his credit rating is sufficiently strong to hold the Shah's support of the airline, is attested to by the fact that Lockheed Aircraft Corp. has offered him a \$30 million long-term loan toward the purchase of a fleet of turbo-prop Ekolans, a credit package amounting to \$5 million could probably pay. His devotion to the airline is evidenced by the fact he has never earned a profit on his investment, yet he is determined to expand the airline until it is operating out of the red.

Afshar told Associated Press he first became interested in airline operations when he discovered the Russians flying from Iran to a commercial base throughout the Near East, and in Iran in particular, during the closing stages of World War II.

## Serious Penetration Attempt

As better forces of communists and nationalistic forces of Russia, high-ranking Iranians found a commercial invasion of their country by the Soviets following the end of the war, and Afshar interpreted the DC-3 operation as a vanguard of that movement. Iran, at that time, was occupied by British and U.S. troops in the north and by Russian troops in the south. The government was to protect the supply line of land route material flowing through Iran into Russia.

Although all troops were to have been withdrawn by March 3, 1946, the Russians were sending additional forces into Iran as late as October of that year and were leading operations of the Tudeh party, local Communist-inspired political group.

Afshar learned from George V. Allen, ambassador to Iran between 1946 and 1948, that commercial operations of the DC-3s by Russia for commercial pur-

poses was contrary to the land-line terms under which the fleet had been loaned by the U. S. Similar procedure was contemplated by the U. S. in its attempt to get Russia to return land-line aircraft ships.

Personally seeking a diplomatic way of ending at least part of the problem, Afshar suggested the U. S. might be willing to sell Afshar the airplanes out from under the Russians. Afshar promptly made a deal, although he had had no previous business experience and by only treaty with consanguinity had come through appointments as ambassador of goods in Iran and as general manager of several Iranian projects.

The Russians made no attempt to deliver the airplanes after the contract with Afshar was announced to them, and Afshar was forced to take possession of the fleet "as it" and "where it," the latter covering the space from Cairo to Tehran. He bought the 39 planes at what he terms "a pretty good price."

## Raising Capital

Afshar immediately obtained the sole right to operate a commercial airline within Iran and then set about to raise capital to organize Iranian Airways. Within a few months, he had gathered enough backers with sufficient capital to start operations and had completed arrangements with Trans World Airlines to handle all communications and combined facilities in Iran.

By 1947, Afshar had grown dissatisfied with his unsuccessful attempts to bring about any consistency of doctrine with his fellow stockholders, and he left the TWA charges for national

structure were "much too high." As a result, he bought out all the original holders of the company with his sole share and dropped the contract with TWA.

Today, the airline is operated solely by Afshar, based in Tehran. All pilots are American, all copilots are Iranian. Maintenance and combined facilities are generally sponsored by Afshar, although 50 of the 90 mechanics are German.

After several years it is not yet hard to tell the airline, but Afshar doubts the day is not far away before the company will become independent of outside help. Under a five-year contract, Transworld Airlines is handling the company's major operating contract.

Iranian Airways' fleet now consists of eight DC-4s, three Convair 240s and three Vickers Vanguard Viscounts. Afshar is now negotiating with Fokker for the purchase of four F-27 turboprop transports and hopes to add Lockheed Electras to the fleet if he can expand the sphere of the company's operation to the extent he wants. As possible, the airline has routes as far into Europe as Frankfurt, a major link in cargo traffic. Afshar now looks to London, Paris and Rome as the most terminal points to be added to the carrier's system. Suggested traffic areas are primarily from Tehran to Beirut, Baghdad, Karachi and Kabul.

## Expansion Plans

Eventually, Afshar plans to extend the Tehran-Beirut route to New York via London but recognizes the need for more experience and faster equipment before he makes a bid for the transatlantic route. Immediate goal is an expansion of routes throughout Europe.

Ultimately, the airline is growing rapidly as an important adjunct to the country's economy and some 17 cities with Iran. Operating as a private enterprise, the airline fits into the Shah's plans to develop an integral commercial aviation system that will spark flow of foreign influences.

The country's mail-building program is being sponsored by the public treasury. A transcontinental school which operates from Bandar Shapur on the Persian Gulf to Tehran and northward across the Elburz mountains to Russian Shok on the Caspian Sea took 13 years to complete and was built mainly at government expense.

Nevertheless, since independence, throughout Iran the communications and direct service is haphazard at best, and Iranian Airways is filling a vacuum gap in the nation's commercial and trade

program. Afshar emphasized the economic expansion within Iran that has developed during the past 30 years and pointed to the population growth—about 15 million in 1946 to 20 million today—as major evidence of the need for a strong transportation system.

## Traffic Growth

Last year, the airline carried 80,000 passengers, Afshar admitted this was an insignificant amount compared with traffic handled by U.S. airlines but noted that "the real picture, that volume of traffic is large and shows growth." Most traffic is now confined to business and government representatives.

To obtain high aircraft utilization as a means of holding down operating

costs, Iranian Airways stresses charter operations as a profitable adjunct to its scheduled service. American businessmen and U.S. government officials are taking full advantage of the charter service offered, Afshar says.

Iranian Airways operates from one of the most modern airports in the Near and Middle East. The 10,000-ft runway of the Tehran airport is being expanded to 14,000 ft in order to handle fastjets.

Despite the fact that instrument landings are not accurate as an average of only about three days a year, an Instrument Landing System will be installed within the next 12 months. Within six months, the field will be equipped with terminal VOR.

## Piedmont Begins F-27 Service; Load Factor Increase Anticipated

By Robert H. Cook

Winston-Salem, N. C.—Piedmont Airlines is introducing record load factor averages for its aviation within the short-term as one of the results of integrating F-27 turboprop transports into the company's present fleet of DC-3s.

The airline has taken delivery on four of the aircraft in its \$7 million order for eight F-27s and expects delivery on the remaining four by next month.

First scheduled service with the new aircraft was begun on Nov. 14, over a route connecting Charlotte, Ohio, Lexington, Ky., Bristol, Tenn., and the North Carolina cities of Winston-Salem, Greensboro, Raleigh, Fayetteville and Wilmington.

Designed specifically for the short stage lengths and small airport disadvantages of local-service carrier operations, the F-27 is considered by Piedmont officials to be "better suited" for the airline's 1,200-mile route system, which has an average stage length of only 90 mi.

## 'Skip-Stop' Authority

While the company feels that the new aircraft can turn in an increased performance and high load factors on "skipped-stop" flights, it hopes for improvement from the Civil Aeronautics Board for "skip-stop" authority which might stretch the F-27's average flight into more profitable runs of 100 miles.

Data filed by the local-service carrier with the CAB was based upon an assumption that it will depend on its right DC-3s be the end of 1961. Company executives are sure, however, that

there are no immediate plans to sell any of the present aircraft assets, since they might be needed if the Board approves any new route authorizations for Piedmont.

Among the additional expenses Piedmont now will incur with the F-27 are such items listed with CAB as a 20% increase in direct maintenance costs per hour as compared with the DC-3 and a 10% rise in landing fees for the larger aircraft.

The company also has signed an agreement with Capital Airlines for the 1,600-hr. overhaul of the F-27's Rolls-Royce Dart engines.

Cost of overhaul per engine was estimated at \$12,000.

The company says, however, that greater payload capacity, passage-up and economical operation of the turboprop engines on the F-27 will not only offset extra costs but also act as increasing operational losses attributed to the DC-3s.

Piedmont estimates it will achieve a 52.4% load factor on its F-27s by next June 30 and a load factor of 55.24% by 1961.

Expected break-even load factor, based on present subsidy levels, is 48.5%.

Actual load factor of the company's DC-3 fleet this year has been estimated the 59.7% mark, and is expected to increase to 58.7% in 1961, according to figures filed with the Civil Aeronautics Board.

Direct operating costs, per available seat mile on the F-27, including flying operations, maintenance and a 10% depreciation, has been estimated at 2.1 cents per mile as compared with the present 2.5 cents for Piedmont's DC-3 fleet.

With a mixed fleet configuration, the carrier estimates it will have F-27 average passenger miles of 62.9 million by June 30, and 76.8 million by 1961, based upon available seat miles of 11.5 million and 13.6 million, respectively. At the same time, the company's DC-3s are expected to generate 47.5 million revenue passenger miles and 15.4 million passenger miles over the same period. The DC-3's load factor is based upon available seat miles for this period of 58 million, increasing to 96 million by 1961.

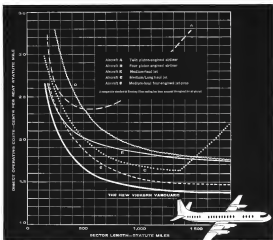


REZA AFSHAR



Vickers Vanguard Starts Resonance Tests

Four Vickers Vanguard turboprop transport is undergoing resonance tests at Warton, England. Rolls-Royce Type 1131B turbo-prop turboprop is installed. Aircraft is scheduled to make first flight next month. First and one section of initial Vanguard are being fitted with British European Airways fuselages (AW July 7, p. 4).



## AIRLINE REPORTS LOWEST SEAT-MILE COSTS

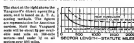
A recent impartial evaluation by one of the world's leading airlines showed that the new jet-prop Vanguard will offer the lowest seat-mile operating costs on all routes from 200 miles to 1,500 miles. The Vanguard, with a maximum payload of 10,000 lb. and a 120-knot cruise speed, was compared to five other modern airliners for economy class jet air services including British and American passenger jets and jet-prop.

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## Travel Agents Urge Jet Sales Incentives

New York-Airline representatives last week were considering a plan by travel agents for higher commissions and other incentives to make the jet age into which most airlines observe before next come mostly from untripped markets. Proposal was before an Air Traffic Conference meeting in Houston.

Most airline officials agree that the travel agents, who now provide the bulk of international bookings and a healthy percentage of domestic business, represent an important part of the needed sales effort. The ATC's action as the American Society of Travel Agents' proposal was such a critical point in developing a problem in inter-airline relationships.

These problems were aired this month at ASTA's 28th annual convention here, at which Paul Charnick told the agents that no new marketing program can succeed to provide traffic to fill the jets.

### Agents' Role

Charnick, author of the Charnick Report to Travel Agents on airline problems (AW Aug. 11, p. 23), said the travel agents will play a significant part in such new programs. But it appeared, during the week-long conference, that inter-airline cooperation in developing the traffic was being considerably obstructed by the following main points:

- Rate of commission. Agents complain that airlines are not properly required to offset rising costs and to provide incentive for wider promotional and sales efforts.
- Credit sales. Agents vainly oppose new credit plans that involve charges which must come out of their own accounts. They would like the airline to travel plan sales to be commission-free, which is not now the case.
- Charter sales. ASTA reports that the volume of special group charters on the North Atlantic new airlines route has a 50% of all air traffic carried over the route. Many of these, the agents believe, consist of unfilled orders then have little group eligible for charter rates and the general public is discouraged agent.

Commercial airlines generally prefer to sell their business through their own personnel rather than pay an agent's commission for it. The agents, on the other hand, point the carrier "commission" in commercial rates and make that up as a agent. But the world's largest of passenger sales.

The commercial business, however, is generally recorded to be relatively narrow as growth potential. Passenger travel is the category in which the travel agents have the highest potential to be developed to exploit jet-age opportunities.

Without substantial increases in traffic, Charnick pointed out to the agents "the airline's future is dark black." He does not believe that the solution is to place heavy reliance on the continuation of jet growth trends, or to suppose that the agency will be able to automatically generate the needed traffic.

Charnick noted that some agencies can be expected as between travel, but that they will keep some at least as a "backup" business. The days of heavy dependence from Pullman travel are over because most of that traffic is already diverted there are only 4-5 billion Pullman passenger miles left.

The domestic market and vacation market, however, is virtually saturated by the airlines, Charnick indicated. Relatively few Americans go to their vacation destinations by air.

Charnick offered a five-point program for agents to do to new markets: a "desperately needed" local program of market surveys, in which the airlines have been "drifted" both in doing too little and in doing what they have done to competitive ends; new price reductions in the airline fare structure in the form of promotional fares, particularly for off-peak routes; "high capacity" advertising to "get people thinking about vacation type in the same way that they think about new cars or a new TV set"; greatly increased budget present plans for air travel vacations; and "open route substitution" of new business.

Advertising Criticized

Charnick said he was discouraged about the present state of airline and travel advertising, which is "basically unresponsive" and "additionally unresponsive" to the person who has already made up his mind to go. He said that the agency is not doing enough to help the airlines. There should be enough talent to come up with a high impact program.

Concerning the present reluctance of many airlines to accept and be re-evaluated as a number of domestic airlines in Boston to acquire about budgeting a top to Miami for the week and half. The results, he said, were that "I would have got in public without carrier and agent in a group."

ASTA Executive Vice President Raymond H. Hering told the agents that the airlines have the "jet" in new at the conference. In their "jet" new at the conference.

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the current and "we shall aggressively present our case." He predicted that airline agent complaints were as much as might be a long and costly battle which might affect the confidence system staff.

International Air Transport Association's recent meeting in Cannes, France, had a hard agent meeting for increased commissions, Hering noted. The report, now under consideration by the Air Traffic Conference, is concerned with domestic traffic.

ASTA recently asked the U. S. Maritime Commission for an industrial investigation of practices of the Transatlantic Passenger (Intercontinental) Conference, objecting particularly to the role of insurance and the recovery of pre-arrangements. If embossed traffic led to a local report from the agents, the conference member might be highly challenged. ASTA's income statement for the year ended in a similar request to Civil Aeronautics Board for an investigation of the entire conference setup, Hering told American Agents.

### Amity Hoped For

However, the ASTA official stressed his hope that sensible solutions would be found between agents and carriers. The proposal now under consideration by the Air Traffic Conference calls for a basic commission of not less than 10% on all sales whether cash or credit, a supplemental commission on pre-arranged business, and a similar percentage on the sale of travel insurance, and specifies that the travel agent "shall be an agent for all categories of passenger sales"—i.e., including commercial accounts.

Against substantial opposition, the proposal indicates that 35.1% of the domestic revenue of 11 major trunk airlines in 1957 was provided by travel agents, or a total of \$122 million. This figure was based on a study of the agents during 1957 was \$63 million, or 51% of their total, according to the ASTA analysis.

Two agents, according to ASTA, booked 75-75% of last year's international airline business.

Commission rates at present are 10% for sales including package tours, 15% for domestic in international, 7% for international points to point or inter-airline sales, 5% for domestic point to point sales.

Regarding charters, ASTA officially deprecates the trend of air and sea combined in chartering, pointing out that their transport capacity is the result of artificially constructed "group," incorrectly and inadequately called "charter." The agent association calls



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as important as the North Atlantic: the "most flugun case" of their activity and were the volume of such traffic is now in excess of 25% of all traffic carried. Considering that growing a "discretionary" privilege to groups "so large as to be indistinguishable from the public itself" is an imposition on the rest of the traveling public, a recent ASTA resolution called upon the carriers, CAB, Maritime Board and others to prevent such practices or to gradually limit them.

ASTA generally supports CAB Executive James S. Korb in his recent report to the Board in a case concerning the appointment and retention of travel agents by air carriers through their Air Traffic Conference. Another report group, Travel Agents Guild of America, along with an agency, challenges in this case the Board's authority to approve ATC agreements regarding appointment of agents.

The case involves the present system under which airlines, through the Agency Committee of the Traffic Conference, pass on the qualifications of travel agents to get on or off the approved ATC list. TAGA seeks to let each carrier act individually as to appointing agents, CAB's counsel wants to continue the system on a revised basis, and ASTA, in intervention in the matter, is on combining the system more or less as it is.

The committee has concluded that the conference system "affords and will continue to offer significant advantages not only to the domestic scheduled airline industry but to the traveling public and travel agents as well. . . (but) there are features of the system . . . which are objectionable to the interests of travel agents and which adversely affect them."

The conference resolution concerning the appointment of agents with its intervention, in not reliance to the public interest, the committee found, provided certain agencies are made. These include dropping the requirement that an applicant agent must be able to be a member of the industry, that reasons for rejecting applicants must be recorded and substantiated, and the "need of services for agency representations in a given area not be considered in the appointment of new agents."

### Middle East Air-Sec Interline Pact Signed

Middle East Airlines and Aerolineas Argentinas have signed an interline agreement for air interchange on the two company's routes. Principal route involved is between Italy and Lebanon. Aerolineas Argentinas operates service from the U. S. to Casco and Naples, along with the airline's Rome-Buenos Aires flight.

## East Germany's Jet Buildup Would Increase Production and Traffic

East German aircraft designer Prof. Berndt Bode said his country's industry will produce jet aircraft both for domestic and foreign airlines.

Bode revealed a major structural change in the medium range BB 112, now designated the 112, which is to be made to meet its original initial test flight date. He spoke at the Second Pan-European Convention of the Dresden Technical University.

A two-ton landing gear with nose wheel on the fuselage and main landing gear on the engine nacelle will replace the broken undercarriage and retractable wheels in the wingspan area mounted in the first two prototypes (AVT, May 12, p. 41). The new prototype is now under construction.

Although not yet officially announced, Aerolineas Vostok has learned that the first prototype will not be flight-tested before the end of the year.

### Reasons for Changes

Bode, sometime jetliner designer who was in the Soviet Union after World War II, said the modified undercarriage made available a larger space for the passenger cabin. Elimination of the retractable wingtip which was to create against their wheels, making new soft ground on either side of the runway during landing.

Cruising speed of the 112 is between 500 and 510 mph, and new gross weight is 112,500 lb. The 112 is designed to be suitable in International Civil Aviation Organization Class F. Second 112 prototype is being used for fatigue testing to destruction.

Bode said it is expected that the greatest effort in East Germany be concentrated on construction of medium-range aircraft whose performance is at least equal to other types available on the world market. The current cruising speed of 450 to 500 mph, a maximum range of 1,250 to 1,750 mi., capacity of 50 to 60 passengers and economical operation. Due to shortage of technical personnel to use in GDR aircraft, the planes would require a large reserve of engine power.

Bode and the German Democratic Republic expected to purchase special-purpose machines each of various kinds outside the country in order to save time and money. But he mentioned that East German aircraft personnel, after a long period of inactivity after the war, had received valuable experience through license production of the Rostov IL-14. Glass equipment in the IL-14 was modified extensively and the

number of passenger seats increased from 18 to 20.

In the case of the new 112, Bode said the four wheel landing and fatigue testing laboratories were erected in the immediate vicinity of Klotzsche, about five miles north of Dresden, and Pans, about 10 mi. south of Dresden. Later, a state-owned research center and technical institutes there were opened. The work at Klotzsche are devoted to an early construction and design, while those at Pans are concerned with construction and design of jet engines.

Bode, who was recently named technical and research director of the reorganized East German aircraft industry, said the industry is concerned only with civil aviation since no military craft are being produced in the Republic.

In a paper on "Tendencies for the economic operation of aircraft traffic in the German Democratic Republic," Prof. Gertt Schmidt of Dresden and East German Luftflotte should build up a fleet of 120 aircraft consisting of two short-distance types, two medium-distance types and a long-distance type. Chalk, the long-distance type, will be purchased outside East Germany (presumably from the USSR) and Schmidt said. When the buildup is completed, Schmidt said, the East German airline would employ about 15,000 persons.

To facilitate air traffic, Schmidt proposed the construction of 30 short-distance airports throughout the Republic. He said that to reduce the number of airline losses in a very big national concern, divided by daily airline costs, he estimated that the U. S. showed a ratio of 26, the USSR 10, West Germany 15 and East German 10. Testing in costs, he said a gallon of fuel in East Germany could be bought at the equivalent of 32 cents per U. S. gallon. The East German was qualified, he mentioned the price could be halved.

In addition to 20 planes devoted to air traffic and its related, 210 were planned in fields of political safety at Dresden. These now about 500 aircraft from East Germany and a handful from West Germany in cooperation with the West German government of the Socialist Society for Aviation (Vereinigung der Gesellschaften für Luftfahrt) in Stuttgart last month. The Dresden conference attracted 100 visitors from Bulgaria, Czechoslovakia, Poland, Czech Republic, Austria, Poland, Switzerland, USSR, Hungary and Communist China.



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## SHORTLINES

► **American Airlines** flew 750,000 passengers a total of 465 million passenger miles during October for 4.1 and 6.7% increases respectively over October, 1957. Air freight totaled up to \$24.45 (Oct) last October at \$19.98, 22% increase. Total mail, express and freight figure showed a 25% increase.

► **Civil Aeronautics Administration**, has invited bids for the posing of three runways at the new Washington International Airport at Clarksburg, Va. The bids, to be opened on Dec. 19, must meet plans and specifications for the posing of two south-south runways, each 11,500 ft long and 110 ft wide, grading and draining of one east-west runway 13,000 ft long and 150 ft wide, and the posing of 75-ft wide parallel taxiways, including two high speed turner taxiways on each of the three runways and the posing of holding pads. Plans and specifications require that all work be finished 60 days after the date of the notice to proceed.

► **CMA, Mexicana de Aviacion**, last week was scheduled to begin the first nonstop flights between Los Angeles and Acapulco. CMA will use Douglas DC-6s and Mexicana Britannia turboprop transports on the route.

► **Flying Tiger Line** revenues for air freight during October showed a 14% increase over 1957, totaling \$1,227,349, a dramatic record for the carrier.

► **Hawaiian Airlines** reports net earnings of \$593,995 for the third quarter of 1958. After payment of interest on debt and several oil terminal interest tax liability, net earnings were \$435,766, or \$1.23 per share.

► **Pan American World Airways** reports that total operating revenues for the third quarter of 1958 totaled \$91,083,306, a slight gain over last year's third quarter figure of \$89,951,080. Passenger revenue was \$72,112,806, up 1.7%; freight revenue up 8.4% at \$6,718,900.

► **Scheduled & Western Airlines** net income for the third quarter of 1958 reached \$1,252,477, wiping out a loss of \$1,213,389 incurred during the first half of the year. Third quarter earnings were equal to \$1.23 per share.

► **United Air Lines** opened 7,076,000 freight ton miles during October to equal the company record set in September. Revenue passenger miles were 458,083,900, up 11% over the same period of last year; mail ton miles were up 16% at 1,671,908.

## AIRLINE OBSERVER

► Which for Japan within the next three weeks to formally accept terms offered by the U. S. to reveal requirements covering the bilateral air transport agreement between the two countries. As a result, Los Angeles will be added to Seattle and San Francisco as ports of entry into the U. S. for Japan Air Lines Pacific routes. Although Japan had fought to via Los Angeles in a co-terminus with San Francisco, it has now decided to accept Los Angeles as a new terminal point on its system without rights to operate beyond. However, the decision can be considered as a temporary one, since Japan will undoubtedly renew its demands for additional U. S. routes in 1960 when Japan Air Lines plans to begin service with its Douglas DC-8 turboprop transports.

► Passenger load factor of 58.6% for domestic mainline carriers in October represented the best monthly increase in 15 months. During the same period, revenue passenger miles showed a larger percentage increase than has been recorded in any month this year since January. At the same time, the increase in revenue miles during October was a significant 1.2%. Most observers, however, feel that the knowledge of the volume of seat miles offered by the airlines is a temporary situation and that the historic upward trend will be resumed early next year.

► "Tulloch Conference of International Air Transport Association will convene Jan. 15 in a final move to resolve the jet embargo issue (AW Oct. 27, p. 10). Place of meeting has not yet been designated. Chances that a jet exchange will be adopted to become effective April 1 are strong. Compensation proposal that Pan American World Airways and British Overseas Airways Corp. require jet flights without no exchange, plus as a means of easing a last difficulty will be delayed because of the large volume of traffic the economy plus-68% of all traffic during July, August and September—is now attracting on the North Atlantic.

► Personnel Indulged by the International Association of Machinists strike against Capital Airlines are protesting the right of a minority union to take an action that keeps a majority of the company's personnel off the payroll. Attempts by local IAM leaders to mitigate members of other unions have failed, and the Capital strike may open the way to closer cooperation among various unions in future labor problems. Out of approximately 7,700 Capital employees, close to 5,000 members of unions other than IAM have been indulged by the two-week strike. About 300 assigned and non-assigned personnel, who are trained on the company's payroll, have been forced to take a 20% pay cut as a result of the strike.

► Midway Air Transport Service has awarded contracts totaling \$553,731 to four carriers for cargo shifts in the Pacific area during the month of November. Out of the 14 companies which solicited bids, contracts were awarded to Transocean Air Lines, United States Overseas Airlines, Overland National Airways and Flying Tiger Line.

► **Ross** now has four versions of its B-18 Mosquito turboprop transport under production for export purposes.

► Domestic airline stocks listed on the New York Stock Exchange are showing new strength in the generally rising market. With few exceptions, substantial gains have been recorded by airline stocks during the past two weeks in response to the expanding market.

► Boeing's successful designations of its 707 turboprop transports indicate not only model type of the aircraft but prevalent model and the airline operating the aircraft as well. For example, the "400" series is the international group designed aircraft powered by Rolls-Royce Conway engines. The "300" series not powered by Pratt & Whitney J75. The last two numbers within the series indicate the airline purchasing the aircraft. The 707-420 is in the Conway-powered Boeing operated by LaBrea, the 707-420 is the same model operated by British Overseas Airways Corp. Planes in the "100" series built in Pan American's 707-221 and American's 707-223, are powered by the Pratt & Whitney J57.



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# Bristol Siddeley

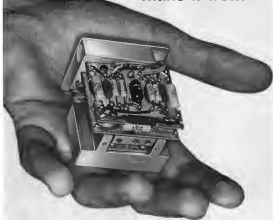
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## SPACE TECHNOLOGY

### Space Vehicle Escape Methods Studied

By Craig Lewis

San Antonio—Development of man-and-robotics for space flight will bring with it problems of escape and rescue that call for solutions involving new techniques and hardware.

These problems are largely uncharted right now, but some of the philosophy concerning rescue and escape was outlined in discussions of escape and ascent here during the Second International Symposium on the Physics and Mathematics of Atmosphere and Space.

Current philosophy on escape systems appears oriented toward making maximum use of the vehicle hardware and very few designs of elaborate separate escape devices. Alfred M. Mayo of Douglas Aircraft Co. and several colleagues indicated autonomous air should be made of making structure and equipment in the escape system. To achieve this, escape requirements must be integrated with vehicle requirements and the addition of single purpose devices should be minimized.

Outlining various parameters of human tolerance, Mayo said, escape systems designed to maintain strict criteria conditions on internal environment within survival tolerance of the crew, could provide minimum practical protection. But such a system could not protect the crew against all possible accidents, external collisions, violent explosion or extremely high radiation concentrations as the kinds of conditions which call for a means to prevent them from occurring either first or as escape systems.

Space operations create a variety of escape problems, a number of which can be solved by an extension of escape techniques but very high performance overall. These fall in the area of launch, atmospheric flight and landing, and before a vehicle goes into orbit or enters space velocity.

In this area, Mayo felt, the escape system of a vehicle should have the structural integrity and stability, plus automatic control and self-contained propulsion, to separate and stabilize its path, deaccelerate and protect its crew during and after landing.

High cost of carrying weight in escape vehicles means weight must be used to a greater extent than in normal systems, so Mayo said an escape system for ground and atmospheric phases of space flight would be the smallest practical part of the space vehicle in order to minimize the size of

separation propulsion systems and deceleration devices and to make relatively high load atmospheric landing.

Escape systems should be located in response and not in separating the unit, rather than tapping a separation propulsion should push the escape unit far enough from the primary vehicle to keep it clear of residual fire or secondary explosion. Overall vehicle should be designed for maximum separation and structural attenuation of explosion or forces developing from failures in the fuel and propulsion systems.

Velocity attenuating and temperature control requirements of the escape system should make maximum use of available structure and equipment. Where said, and should depend in large measure on extra deceleration and control devices designed for emergency use. He also advised the use of shock controls, such as landing, and absorption of shock by endosteum, deceleration and by proper selection of surface materials for several months use.

Moving into the area of orbital and escape speeds, the vehicle creates a new set of escape problems. Here the escape unit will have to provide the same protection against radiation and reentry and the same internal environment as the primary vehicle. Defense against reentry problems in landing and returning escape unit.

Adopting computerization, escape air locks and emergency oxygen sources needed to permit response reactions of a damaged or leaky compartment, and repair vehicles or emergency clothing will be needed to allow repair work in emergency areas.

Mayo pointed out, however, that high performance land craft capable of maximum separation thrust levels or ad high structural loads as they do clear to the earth.

In free space, Mayo said, the escape vehicle should be the largest part of the space vehicle system that would permit separation of a degraded and functioning component. Thus, provision for functioning of previously designed components and under action, propulsion systems or even fuel might be a more practical escape approach than use of a manual escape unit required to meet atmospheric flight conditions.

To take a cue, Mayo pointed out that emergency communication systems would be essential to avoid loss of response that had survived an accident.

Trade information for decision to escape and controls for achieving it are needed, and Mayo felt such data plans and controls should be integrated into the overall vehicle display and control system. Information provided should take full account of the capabilities and functions of the launch vehicle and the escape system. As can be made of human decision. Automatic safety systems can take over in emergency requiring response faster than human capability or when loads applied to the vehicle are likely to have exceeded the crew.

Mayo emphasized that automatic systems can be relied upon only in emergencies "which are sufficient to preclude the possibility of human action."

A high degree of automation was stressed by Robert M. Stanley of Space Division Corp. in a paper prepared for the symposium. He said that the continuation of human reaction to emergency, Stanley said it appears practical to have a means of the escape as possible carried out in at least some circumstances in a command to a command to either from the crew or "other competent bottom person."

Other data giving the crew a "passive button" to grab, Stanley said, the escape vehicle should be fully automatic. "And I am not so sure but what the passive button itself should be directly visible during a major portion of the flight."

For escape during an emergency on the launch pad, Stanley said, emergency exit types could be adapted for use in conjunction with a hot operating parachute. An ordinary ejection seat would be sufficient for escape up to about 30,000 ft., and an escape seat would do the job up to 100,000 ft. he said.

Stanley pointed out, however, that the escape seat could not be used up under heavy loads, and that its usefulness would be limited to the first minutes after launch and the terminal phase after the space vehicle had slowed to Mach 2 or less.

Two men from general escape devices, Stanley concluded that the final stage of the space vehicle itself is the most attractive escape system. First stage would need a capability for low-altitude separation while on the launch pad, and then capability would extend through the atmospheric flight phase. Space vehicle would be the last stage

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| Number of Contacts | 7.5     | 15      | 30      | 75      | 300     |
| Current Rating     | 7.5 amp | 15 amp  | 30 amp  | 75 amp  | 300 amp |
| Pin Size           | 1/8"    | 3/16"   | 1/4"    | 5/16"   | 1"      |
| Pin Length         | 1 1/2"  | 1 3/4"  | 1 7/8"  | 2 1/8"  | 4"      |

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for the crew during ejection, and it could be provided with an emergency parachute landing capability.

Discussing the role of the final stage (which is an escape system in the event of a launching accident, Strickland stated that it would take roughly seven seconds to eject then would be needed for a man to eject safely. But he pointed to the advantages of having the crew escape in flight situations. The man has absolute emergency and with an air escape, parachutes descended.

Escape could be effected by the crew in command from the launch area or in intermediate distances within the space vehicle itself. Selection of the thrust vector could be preprogrammed without interfering with the reliability of the escape system for late use in maneuvering control.

Strickland stated that an escape capsule could be designed which would be smaller than the final stage and thus offer less mass to be propelled from the launch area. He said the problem of separating the probe design considerations from the escape vehicle and "it seems that for a given expenditure of money and for a given standard of reliability, it could be far more feasible to make the final stage lighter, perform the entire escape function and to give it the capability of escape even though it itself is hurtled and broken and no longer useful as a firing vehicle."

For rescue and retrieval missions in space, Norman V. Peterson of Lockheed Aircraft Corp. Missile Systems Division outlined a pattern of operations for the area between the earth and the moon. He said extraplanetary missions will destroy the use of rockets with redundant systems.

Kurt Ehrlich of Convair-Astronautics Inc. stated that the need for rendezvous systems for long-range flights and the largest moon is one of the secondary vehicle.

Peterson pointed out that rescue missions will be carried out with expendable emergency capsules where short flight times will be called for to avoid time consuming. Rescue missions involve less rugged conditions and permit less energy flight paths for intercept and retrieval of crews in peril.

Achievement of manned orbital capability will permit construction of large satellite facilities in orbit and also provide the capability to maintain, repair and replace complex satellite devices, Peterson said.

Greater concentration of space craft probably will be in the circum-orbit area, Peterson said. "Vehicle traffic, including surface-to-orbit, orbit-to-orbit transfer and return, will pose logistical problems. Systems failures during flight maneuvers will pose rescue and retrieval problems requiring the

phenomenon of rescue and rescue emergency operations."

For rescue and retrieval missions in the circum-orbit area, Peterson suggests both ground-based and satellite-based emergency vehicles. He concluded that satellite-based rescue and retrieval vehicle systems present more flexible operations than ground-based systems.

Discussing some of the problems of these systems, Peterson said that determination of the severity of emergency conditions would be difficult and determining the orbital characteristics of malfunctioning vehicles might require satellite-based tracking systems. Retention of the orbit plane and changes

in orbit plane definitions require high expenditure of propellant, and use of separate emergency vehicles in each orbit plane would be required.

Short time paths for orbit-to-orbit transfer call for a large expenditure of propellant acquisition of orbit to the orbit, he said. Moreover, escape from the rescue longer transit, and that the more linearly rescue mission can be performed, even for a broad range of orbit-to-orbit transfer.

Peterson said that, due to errors in determining target orbit characteristics, retrograde and course and to guidance corrections will be required.

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Providing a new systems approach that follows through from initial plan to final production, the Bendix Systems Division serves as the focal point for the twenty-five strategically located divisions that constitute the Bendix Aviation Corporation. The new building, designed for engineering and managing of major weapons systems, is adjacent to the Graduate Engineering School of the University of Michigan in Ann Arbor.

This structure and its additions will accommodate a staff of 1,000 including engineers and scientists who

will explore new concepts in communications, guidance and control, infrared, data processing, aerodynamics and propulsion, radar, acoustics, and countermeasures. Weapons systems now being developed by this Bendix division include air defense network improvements, global weather reconnaissance, special radar applications for detecting ballistic missiles and low-flying aircraft, underwater surveillance, missile and traffic control, and a supersonic aerial target system for testing operational capabilities of the latest weapons

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## Missile Lessons Have Application To Space Aeroelasticity Problems

It Would—Although new problems of aeroelasticity are arising with the advent of space flight none of the basic laws and concepts developed to cope with aerospace loads will apply to this new environment.

This forecast was made by a panel of the late Institute of the Aeronautical Sciences national symposium meeting on dynamics and aeroelasticity.

New and different types of space craft, along with a new environment as involved in space flight and V. L. Burton of Thompson Ramo-Wooldridge Corp. reminded the NAS group that a number of interesting factors are involved in the complex vehicles. All these factors must be considered as a unit in dealing with the problems involved.

Space vehicles will encounter the

aerodynamic forces which formerly dominated aerospace problems only loads in steady flight paths. But the nature of the vehicles themselves will create new problems. Very slow motions which last possibly 90% of their weight at fuel burn as the loss of a whole missile system, and the new type of structure involves new factors and flight conditions.

Liquid-fueled missiles, which will serve both as weapons and boosters for space studies are subject to changing loads as their fuel burns. This requires change, and all frequent must be designed for because all will be varied during the flight regime. Solid fuels also present problems, including fuel movement.

During the flight of a missile, aeroelasticities must be concerned with the



Graphite tube furnace is used for ablation tests of structural plastics under steady, steady flow of Wright Air Development Center by General Aeronautical Laboratory scientists.

### Scientists Conduct Ablation Tests



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Adaptability to space conditions is a feature of the German Pump as several examples show and then your requirements have been met. The unit, the German pump has only two moving parts, a ring gear and a rotor. The rotor is a ring gear and a rotor. The rotor is a ring gear and a rotor. The rotor is a ring gear and a rotor.



Fig. 1. Various units within the German pump are easily adaptable to space and capacity requirements.

Further space-saving adaptability stems from the fact that the German pump, unlike conventional pumps, is in space only a single shaft. This means that the German pump can be installed along a single shaft in partial compartments within a single housing and mounted on a single AN rail to perform such multiple pump functions as: air, nitrogen, liquid, etc. (Fig. 2). Each compartment allows pump configurations that can be adapted to your box or other installation readily. A well-known German pump can be submerged in a tank, which may be part of the pump housing.



Fig. 2. Multiple function pump.

Reliability is another inherent feature of German pumps. Their rotors are design and dimensionally balanced over their parts assure quiet, trouble-free operation over a long service life.

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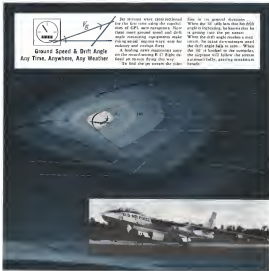


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For vectors were cross-correlated for the first time using the computer. GPL uses navigation. Now these most ground speed and drift angle measuring experiments make this possible. Vector wind speed for industry and aviation theory.

A leading 1970 experimental study on the measuring R.T. flight deck on an air force flying this way. The first step was to measure the vector

time in its ground direction. When the air force has that the drift angle is increasing, he knows that he is going fast. The problem is that when the drift angle reaches a point where the wind direction and the drift angle both are zero. When the air force has that the vector, the vector will follow the ground speed totally, giving maximum in time.



## Cross-section of a headline

Headlines were made the day a GPL auto-navigator guided a USAF B-47 into the jet stream over California, set her down only 3 hours and 47 minutes later in sight of the Atlantic?

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GENERAL DYNAMICS — GPL Technologies have opened up some unusual research and development opportunities. Some account in Personnel Manager.



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RADIAN<sup>®</sup> Navigation System, recently released for civilian use, are now available to everyone. They save precious time and fuel for the airlines, provide a priceless margin of safety for all.

the ordinary undergraduate engineering education. As they observed that the location of space in bringing students to class and that gauge education must be provided for them.

Barnard, developed methods for better analysis of wing theory was the director at the IAS meeting. Numerical methods involving the local function have been developed at MIT and at National Aeronautics and Space Administration's Langley Research Center which make use of large digital computers.

A method for better analysis of low speed, wing wings was developed by Prof. T. H. Liu of MIT. It is a numerical method for solving an integral equation involving prediction of aerodynamic loads, and Prof. T. H. Liu says it produces improved results over traditional solutions previously used. He said the MIT method differs from other solutions in that optimum conditions are imposed in the solution.

A somewhat different method for solving the same equation was presented by H. J. Cummings and D. S. Workman of NASA Langley Research Center. This method, involving kernel function properties, produces similar results but reportedly takes somewhat longer to run through the computer program. Both the MIT and NASA developed methods compare favorably with other theories and with experimental results, they reported.

A new method for using a rigid two-dimensional wing model for determining oscillation properties of certain points on a wing resulting from a pulsating downstream source at a fixed point was described by H. N. Abramson of Southwest Research Institute. Wing model has a blowing and sucking device which creates a fixed point, plus a pattern of pressure fluctuations on its surface. Tests were conducted in a subsonic wind tunnel.

Use of a rigid model would be superior than the more complex flexible method in experimental work. Abramson and tests showed the rigid model method feasible for subsonic winds, and he said that it was rigid in improvement and important flow, too. He acknowledged that the method is an early stage of study, but said that it did merit somewhat further development.

On many model tests conducted on the Bell X-2 landing configurations are described by J. N. Deitzmann and Monroe Schreiner of Bell Aircraft Corp. Model tests were performed when wind gusts light tests showed the X-2 had a ground yaw-coupling problem.

Results of these tests are understood to have been used in development of the North American X-15 landing gear. AVI Oct 25, p. 20.

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## COBALT 60 AND THE MATADOR

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As part General Corp. technicians would power and on second stage of NASA lunar probe. Thickness of this was increased to carry weight of the third and fourth stages and control system.

## Lunar Probe Second Stage Readied for Florida Launching



Second stage of lunar probe (above) is checked out by test system. Top end of stage carries control system developed by Space Technology Laboratories which has overall charge of technical direction.

Launching vehicle is hoisted into service tower (right) from a trailer. This stage integrates Atlas-Apollo/General MATD engine using conventional ducted turbine and white firing after seal.



Lunar probe, second stage, undergoes tests at Cape Canaveral, Fla. Stage was hypersonic tests requiring an accurate ground station and propellant test chamber supports before penetration system. Stage weighs more than 4000 lb. and develops about 7500 lb. thrust.



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# MISSILE ENGINEERING



**PROPELLANT HAZARD** evaluation facility at Navy Air Rocket Test Station, Lake Denwick, N. J. is an hell in background (left photo). State threat rocket test is in foreground. Main test area, in center of photo, consists of variable altitude test stand. Threat state being tested, two single solid fuel units and two dual liquid engine stands. Nitrogen oxide room (right photo) at Navy Air Rocket Test Station is set up to supply high pressure gas state being of large liquid propellant engines on a 100,000 lb. thrust test stand.

## Navy Expands Role for Liquid Propellants

By Michael Yaffee

Lake Denwick, N. J.—Contrary to its traditions, the Navy is not restricting itself to solid propellant rockets for shipboard use. Instead, Navy men are now learning to live with and solve the problems of handling liquid propellants aboard ship in preparation for the next generation of Navy missiles and aircraft. Missiles likely candidates for liquid engines are air-to-air and air-to-surface

missiles, high performance jet fighters (on a supplementary power source) and target drones. Most specifically, it is known that liquid engines are under consideration for Chase Vought F4U-3 (AW Year 9, p. 21), North American A-1F, and (AW May 18, p. 24, May 26, p. 30), Northrop Sparrow III and Mach II. Two other liquid powered jets are the Eagle (AW Oct. 11, p. 14) and the successor to the Bellhop.

**SEVEN** Mach diamonds in rocket engine exhaust are an indication of the high performance potential of the liquid propellant engine being evaluated at Navy Air Rocket Test Station.



At present, solid propellants seem to monopolize the Navy's missile arsenal. But for superior performance, liquid propellants are essential.

Solid propellant considerations have been talking for some time about making the specific impulse of liquids. But Cmdr. Robert L. Beeler, chief engineering officer at the Navy Air Rocket Test Station here, doesn't believe they will catch up with the liquids. Most important, solid propellant grains, despite all efforts to drive, remain sensitive to temperature changes, a critical factor, particularly in the performance of air-to-air missiles.

### Program Responsibility

To offset these drawbacks, the Navy is turning to liquid propellant rocket engines for a number of missiles now under development. In so doing, responsibility for the engineering program rests largely with the Navy Air Rocket Test Station, located on the site of the old Naval Ammunition Depot at Lake Denwick, in northern New Jersey.

Two years ago, the Navy decided to divorce its solid and liquid propellant rocket engine work, giving responsibility for the former to Bureau of Ordnance and for the latter, to Bureau of Aeronautics. But, in fact, has divided its responsibility for rocket work between Naval Air Missile Test Center at Ft. Meigs, Calif., flight test and evaluation, and NARCT, static testing and development.

One of the most important programs now underway here involves propellant liquid rocket engines. If liquid

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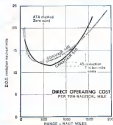
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Graph below shows the very definite advantage in terms of productivity of the Challenger "540" over the "440", which is as much as 14% in their optimum ranges. This indicates that for equal aircraft in duration the "540" could produce 14% more ton miles, or equivalently, the Challenger "540" fleet size required to do the same job would be reduced by 14%, with a consequent saving in capital investment.



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# FROM THE WRIGHT FLYER TO THE RHEEM SD-2 SURVEILLANCE DRONE

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On December 23, 1907, Brigadier General James Allen signed Army Signal Corps Specification No. 486 and made history. It was the first specification by the U.S. Government for "a heavier-than-air flying machine with no gun bag." On February 8, 1908, the Army Signal Corps accepted Walter and Orville Wright's bid to provide a machine to meet this "fantastic specification," as it was headed in the press of that day.

Provisions of the specification included: "2. It is desirable that the flying machine should be designed so that it may be quickly and easily assembled and taken apart and packed for transportation in army wagons... 4. The flying machine should be designed to have speed of at least forty miles per hour in still air... 8. The starting device must be simple and transportable. It should also land in a field without requiring a specially prepared spot and without damaging its structure... 10. It should be sufficiently simple in its construction and operation to permit an intelligent man to become proficient in its use within a reasonable length of time..."

It was intended that the Wright Flyer be used for military surveillance, but, although it had to meet tough Army standards of reliability, its performance was seriously limited. Carrying a pilot and observer, the old flyer could only be expected to labor dangerously over enemy positions in broad daylight.

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performance drone that darts in and out over hostile positions, night or day in all kinds of weather, providing battlefield commanders with an up-to-the-minute picture of enemy activities. Flying ten times faster and a hundred times higher than the early Wright

Flyer, the pilotless SD-2 substitutes electronics and photogrammetry for pilot and observer... but still must face up to the same rugged Army requirements for field reliability.

Like the Wright Flyer, the Rheem SD-2 can "be quickly and easily assembled and taken apart and packed for transportation..." (In Army trucks, trailers, or Flying Beocars.) "The starting device" is "simple and transportable." In the field, a standard M-281 truck transports four fully assembled SD-2s, and a zero-length launcher on an M-10561 trailer provides the completely portable launching device. And, for "landing in a field without requiring a specially prepared spot and without damaging its structure," the SD-2 is provided with a reliable parachute recovery system.

Proving its ability to meet the Army's age-old standard of "simplicity in construction and operation," the Rheem SD-2 is presently being put through its paces at the Army Electronics Proving Ground, Fort Huachuca, Arizona. After passing rigorous Army flight tests, the SD-2 will take its place in the field as another reliable combat system contributing to the superiority of U.S. ground forces everywhere.

If you would like to have a 7" x 12" reproduction of "Signal Corps Specification, No. 486" suitable for framing, write Dept. AW-497-L.



Standard M-281 truck transports four fully assembled SD-2s.



A zero-length launcher on standard M-10561 trailer provides completely portable launching device.



A single SD-2 drone mounted on trailer shows drone engine power to parachute off.

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**TANK AND SPIRIT** (left) pumps, evaporators, high pressure starters and high pressure water for static tests at Navy Air Rocket Test Station. Airframe component elements (right) are used by Navy engineers to evaluate the low temperatures of the space air. The chamber on right is a holding tank for air storage of temperatures.



refuels are to replace solids, particularly in an launched missile they will have to achieve the same instant condenses in the solids. And if they are to be used stored ships, they should require more than prepacked handling and ground support equipment.

A small service is specific popular compared to the higher performance engine fuel engine, the propellant liquid propellant fuel in the future, which both objects in solid retaining most of the desirable characteristics usually associated with liquid rocket engines.

Attained by these advantages Navy Rocket has been actively pursuing the development of propellant unit in conjunction with Rocket Motors Division of Thiokol Chemical Corp. Reaction Motors has developed a family of propellant liquid propellant which it calls the Guardian. Each engine is an integral unit which includes propellant tank, thrust chamber and all other components necessary for operation.

### Guardian I

Baker has awarded Reaction Motors a contract for the production of Guardian I, a small engine of 5,000 lb thrust destined to replace the solid propellant unit in the Sparrow III and a contract for the development of the Guardian II, a slightly larger engine, of 10,000 lb thrust expected to replace the solid propellant unit in the Hellcat.

Until recently, the propellant liquid propellant looked as though they were going to be replaced by a new burner from moving into the engine and large thrust engine. But Reaction Motors do think that it had developed and fired a propellant liquid propellant of 10,000 lb thrust (AVR No. 10, p. 33). Successful

firing of this motor is considered a significant development that demonstrates the way to propellant liquid engines of unlimited size.

NARIS role in this project is as a field engine and consultant to the test. It is making evaluation and qualification tests on the Guardian I, which in Navy parlance is the Sparrow III liquid rocket engine. NARIS will do the same on Guardian II, and will write the specifications for all propellant liquid engines developed for the test.

NARIS contractors are also actively engaged in the research and development of superperformance rocket engines for aircraft and missile applications. In addition, they are serving a number of new nonpropellant fuels and engines. At present, they are just starting to develop in high energy fuels and hydrogen fuel engines.

Alaska an important consideration with Navy missiles with the water of shipboard propellant handling. Guardian I, NARIS is completing experiments of a propellant liquid propellant facility. Next, Navy hopes to determine first of all the feasibility of the different and kinds of handling different fuels and engines stored ship. Later, it will be used to evaluate the hazards involved in handling fuel tank, tanks or propellant tanks.

### Technical Projects

Among the other projects that make up the current technical workload at NARIS are the following:

- Research and development on variable thrust liquid rocket engine. NARIS section has developed a technique for providing liquid rocket engines with a 25-lb. thrusting capability.
- Investigation of new techniques for

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### What Are The Properties?

It should be emphasized that these rubbers are not merely new family of polymers which can be adapted to elastomer which can be adapted to elastomer to provide varying degrees of heat resistance. When specifically they will offer what already exists in the current state of the art. Based on general discussion, rubbers of GE and Ultrasil Carbide, however, this is what we expect:

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## Catching The Airbus?

**Turbo-prop comfort  
at 84, a mile—  
and carry your car, sir!**

The A.W. 671 Airbus, a variant of the A.W. Argosy freighter, will be able to operate over stage lengths of about 800 miles at a direct cost of under \$4, a seat mile. This should greatly ease the economics of operating on ultra-short routes—the routes on which, at present, most operators find it difficult to make any profit at all.

A double-decker carrying 180 passengers—30 upstairs 90 down—the Armstrong Whitworth Airbus heralds an era when short-distance air services may run like coachmen and trams—regularly every hour.

The Airbus has the same basic fuselage as the A.W. 670 Air Ferry which carries 6 cars on the lower deck and 30 passengers above. Operators whose car ferry traffic is purely seasonal will find it easy to convert Air Ferry to Airbus and vice versa. The spacious hold of this aircraft can, of course, be used for general freightage.

These two variants illustrate the care which Armstrong Whitworth, in planning the A.W. Argosy series, has taken to offer operators maximum flexibility.



By W. G. Armstrong Whitworth Aircraft Ltd.  
Bridgton, Gosport, England  
MEMBER OF THE HAWKER SIDDELEY GROUP

MAKE THE SHORTEST ROUTES PAY WITH THE A.W. AIRBUS/AIR FERRY

the construction of lightweight rocket engines.

- Evaluation and qualification testing of Silverclad metal and gas generator
- Development of a hot transfer rate rocket engine
- Consultation with FALCON Space Corp. on a hot injection device
- Investigation of the detection of hydrogen peroxide (HP) sensors
- Development of measurement criteria for design purposes
- Experimentation in high pressure of engine using hydrogen peroxide (HP)
- Investigation of engine tests for direct electric rocket engines

Officially, NARTS' mission is to conduct tests and evaluation of rocket engines, their components and propellants.

In reality, the work here began widely over the liquid propellant rocket engine field, from comparatively basic research in high energy propellants to the manufacture of a test rocket engine. The studies, however, is definitely not a manufacturing center and steps short of making even service prototype engines. Nor does it get into test research. Unlike the Naval Ordnance Test Station at China Lake, Calif., NARTS has no back-end work for independent research and so carries out work, such as engine tests from Baker or in support of some other program.

The most important group at NARTS is the Engineering Department which carries out the technical tests required in the studies. The other departments serve mainly to support this group.

The Engineering Department, which is under the direction of Capt. Richard J. Gardner, captain, consists of a rocket engine division, a propulsion division, an engine service division and a general group. In addition to Capt. Gardner and another Navy engineering officer is a staffed by 25 civilian engineers and clericals and about 54 non-civilian civilian technicians.

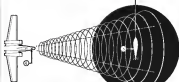
Total number of engines processed at NARTS, including Engineering Department, is 154. Total staff is 1,000 employees.

Chief operating officer of the Naval Air Rocket Test Station is Capt. John J. Kierulff.

In addition to the old sea-water test engine facilities, NARTS, selected from its personnel, the Naval Air Rocket Test Station, the physical facilities of the station consist of two dual (4) liquid rocket engine test cells rated at 10,000-lb thrust, two solid engine test cells which again cannot all be capable of handling liquid rocket engines of 50,000 and 55,000 lb thrust, 100,000-lb thrust solid constructed originally to test the 50,000-lb thrust

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booster designed for the Navy's old rocket engine.

Conversion of this test stand is scheduled for completion in another six months and will give NARTS the capability for firing regular liquid rocket engines in almost any attitude from horizontal to near vertical. There is also a \$150,000 to design stand for liquid engines that Reaction Motors is now using for its N-15 engine program.

Other NARTS facilities include a component test laboratory for firing engines, power tests, the advanced thrust propellant hazard evaluation facility, chemical laboratory, alternate component chamber and a computer-aided modern administration office building.

#### Engineering Department

Stuhler's test program has a replacement value of \$16,400,000 and equipment, a replacement value of \$2,000,000.

In the next two to three years, NARTS expects to spend about \$4 million on improvements for its engineering test facilities. On an average, Cash-Bender estimates, NARTS spends approximately \$75,000-\$85,000 a year for equipment. But this figure is expected to increase as the first liquid rocket engines move out of the development program and into operational Navy service and aircraft.

NARTS actually signs no contracts. This is done by Baker. For purchases in support of its own activities, it does have a general equipment fund which it is free to spend as cash flows. But all major purchases must be funded specifically by the Navy. Construction of large test facilities is handled under the classic "cost-plus" development program. NARTS is presently planning its program for Fiscal 1968 funds.

#### New Programs

As far as new ideas or programs go, this is also handled by Baker. In-house new concepts with NARTS, but potential contractors must go to Baker to sell their new specific ideas and ideas. Recently, these ideas are about general control systems, i.e., systems intended to work with NARTS, and vice versa, but upon all formal human meet talk also at the Baker level.

As NARTS staff uses its role in the Navy's growing missile program it can add its greatest contribution to be as a technical information source and as an aid to Baker. Next, as order of importance, would come its propellant-based investigations, support work in cases out for Baker contractors and its research and development on new propellants. The superperformance rocket engine program, which is tied in with its support work, will be very ac-

cessed in the future, says a NARTS spokesman. But the superperformance rocket could actually provide the most important product to come out of NARTS.

Another and somewhat general focus was that NARTS currently holds as that of a training center for Navy missile men. Navy's major personnel to serve in this Engineering Department for the purpose of obtaining experience in the handling, servicing and operation of liquid rocket engines and their test facilities.

This is a function that is one to give in support of the first liquid-powered missiles become operational in the last.

## Steam Ovens Bake Solid Propellants

Steam-heated industrial ovens are planned to bake polystyrene solid propellant in a Thosked Chemical Corp. plant, Tex., under engine flight.

Power ovens are being used in this coming on the camp and allowing it to be used. Con is then started in the rocket engine and the ovens charge is passed around it. Solid engine is used in the oven of 1800 to 2000 to a black rubber solid. Con is then removed.

Ovens are built by Dispatch Oven Co., Minneapolis, Minn.



## Is Your Engine Dying in Storage?

Engines lose in storage as 50 hours of their potential operating life—while waiting in storage. That's the destructive enemy of polished steel surfaces and away from the engine, makes it, builds up new sources of friction.

In spite of plastic bags, preservation paper and preliminary oil spray, trapped moisture still causes corrosion. Under normal shop conditions, moisture enters with the air used in spray preservative oil. The moisture pool plastic container traps it as an invisible surface film.

Airwork's moistureless corrosion problems. No air drying system is

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**BOTTOM** (left) set of waste data recovery capsule houses tape recorder in bottom, battery pack in foreground, pressure box in background, also contains two boxes at left, and a MIC-UR bomb (probe) in center. Middle houses a timing screen-off entry interface.

## Recoverable Data Capsule Designed For Thor and Atlas Test Missiles

Philadelphia, Pa.—U. S. Air Force men can obtain a prelaunch record of Thor and Atlas intercontinental ballistic missile flight data needed for the new come development program through use of small, recoverable data recovery capsules.

Aerobic equipment contained in the capsules covers spin rate, altitude, inclination during the missile's re-entry phase, and also contains ground chase radio interference during the flight. Capsules are located in the nose cone and are ejected at a predetermined point prior to nose impact (AWF No. 17, p. 77).

The capsule developed by General Electric Co. carries a small magnetic tape recorder that records and stores during its recording periods all recorded flight data relayed from the nose cone during flight. The data includes

readings on temperature, pressure, stress, acceleration and deceleration.

In addition to pushing against a charge microphones of the used data relaying, the capsule obtains the necessary for recovering the nose cone.

The capsule is an 18-in. sphere made of stainless steel, glass and fabricated in two hollow hemispheres. Into what becomes the bottom half goes the tape recorder, a pressure box, battery pack, air cooler and a sound trap and ranging beam is built (see fact) in the capsule which leads information from the nose cone sensors in the tape recorder.

There also is an opening in the bottom hemisphere, in exposure of a salt water orifice. The top half of the capsule contains a radio beacon, its antenna and four ground planes for the beacon which are pushed through the

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Supersonic XQ-4 target: another advancement in a 20-year record of design and production for all of the U.S. Armed Forces.



Denies grave kill assurance, spares time and war hours in spending the vital pre-mission checkout of six proven U.S. missile systems.



Supersonic USAF T-38, first of Northrop's new N-155 aircraft family, will train space age crews at minimum cost, in twin jet mode.



The new N-156F constant altitude fighter, now being built at Hawthorne, Calif., is proof of Northrop Aircraft's ability to create higher quality weapon systems at lower cost. This and other Northrop contributions to national and international defense are products of the Company's cost-oriented management team and of Northrop-developed, years-ahead production techniques.

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Beverly Hills, California











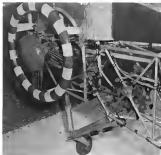
VERTOL V6 VTOL-STOL, which hovers with wing tilted at 42-deg. angle of incidence. Foreground is Lyscom Y101.1.

## Vertol 76 Control Tested in All Regimes

Twin-engine Vertol 76 flying VTOL-STOL, research aircraft, has recently completed the basic portion of its study contract and development has progressed to a point where full-scale system trials—down to the level of engine cycles—can be expected to become routine operations.

The control system also has been developed to a point where adequate controllability exists in all flight regimes, according to Paul Danek, Vertol VTOL project engineer. The contract is sponsored by the U. S. Army and coordinated through the Office of Naval Research (AW

34-23, p. 24). The initial phase of the contract having been completed, Vertol is approximately one-third through a follow-on control flight program to establish controllability, structural integrity, and flight qualities of this configuration in a variety of modes not related to the original



TAIL FAN on the Vertol 76 is shown in left photo. Arrow points to the control quadrant. The new quadrant controls pitch the full quadrant controls (see photo for an tail right photo) is mounted in elevator control. The new fan is on the right side of the tail.



### Vertol 76 Specifications

|                            |               |
|----------------------------|---------------|
| Wing span                  | 24 ft. 11 in. |
| Length                     | 25 ft. 9 in.  |
| Height                     | 18 ft.        |
| Horizontal tail span       | 9 ft. 11 in.  |
| Rotor diameter             | 9 ft. 6 in.   |
| Rotor tip diameter         | 2 ft.         |
| Wing area                  | 110 sq. ft.   |
| Wing loading               | NACA 4415     |
| Gross weight (approximate) | 3,200 lb.     |
| Empty weight (approximate) | 2,900 lb.     |

contract. Following this phase, expected to require some 20 flying hours, the Vertol 76 test bed is scheduled to be delivered to NASA for evaluation.

The Vertol 76 (JAN designation, VZ-2) has accumulated more than 15 flying hours covering extensive hovering tests, six flights in the airplane configuration and 17 complete multi-flight conversions. In a recent ground-air conversion before the American Helicopter Society at Ft. Belvoir, Va., pilot L. J. LaVigne made a conversion from vertical lift-off configuration to approximately 90% airplane configuration at approximately 100 mph, carrying 800,000 ft. of runway during a strong right-angle crosswind gusting over the runway stop. Safety considerations, using three a device to avoid a deep recovery of one side of the runway, prompted the pilot not to attempt full conversion.

To speed the development-to-flight mode, Vertol engineers of fixed control components in such as possible. The preprototype is a single Lyscom Y101.1 aircraft, tilted at 42° slip, but altered to deliver 600 mph maximum rotor speed in all flight regimes, at 1,400 rpm.

Power transmission to the rotor, utilizing three blade rotor-propeller on the flying wing, is by means of an internal shafting, the rotor-propeller being subsonic mechanicals. In case of a power failure, this would operate the engine by means of a spring clutch installed in the upper control transmission (Danek reports). The main engine controls are a type of selector and power lever the rotor speed being automatically selected and maintained by a governor in the T51.

### Tail Fan

Two fans, fan pitch and yaw control, are mounted in the tail. These are five-blade units, both 1 ft. in diameter, each for controlling of four solid brass and half-inch blades being stainless steel leading edges. Both fans have variable-pitch blades and are rotor connected by mechanical shafting. They operate at some 5,500 rpm. Drive is by a smaller lower transmission connected by shafting to the upper



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actual gear box from the T31. A final coupling reduces large motor torque experienced early in the test program during rapid control displacements and accompanying changes in gear torque reaction. As long studies and actual flight tests show that the final coupling arrangement for tail fin drive shafts has reduced the amount of dynamic overtorque to less than 5%. Ditch and V-draw 3. Peak, shaft of stress, speed growth rate.

The main motor propeller are each 5.5 ft in diameter and are combination axial and crosshatch with stainless steel leading and trailing edges, built-up steps connecting to the bearing housing to help carry centrifugal forces.

An optional blade root cushion for maximum static thrust has been incorporated by a linear twist of 24 deg down to the centerline of rotation.

Maximum static thrust design was chosen over high mass efficiency since performance considerations were of low priority on a test bed type aircraft. Blades are rigid in plan, of solution.

Reiter pressure are connected to the propellant in series of drive shafts to right angle gear boxes mounted on each nacelle. The shafts passing from the upper control gear box mounted at the T31's power output end through the fuselage hinge points.

### Pilot Controls

Pilots controls consist of pedals, control stick and collective pitch lever. A full control is in series of differential collective pitch is the main

control switch to operate the hydraulic servo cylinder which operates the wing. Pressure is derived from a pump on the central transmission gear box. The wing is fixed to the fuselage by two self-aligning bearings.

Hydraulic system is of the 1,500 psi type.

An inner flight control is achieved as follows:

- Vertical movement or descent is accomplished by raising automatically and equally the collective pitch of each rotor-propeller by means of the collective pitch lever.
- Roll control is in series of differential collective pitch is the main



Wing center section of V-22 Osprey is shown in vertical takeoff position. Aircraft's cockpit is forward left, but is forward right. As seen points to the hydraulic actuator for wing tilt. The fly as the actuator is in place while the aircraft is active in ground configuration but forward wing tilt. The T-shaped upper control transducer (fixed wing tilt actuator) located in forward and at location T31-1-1 power plant transfer power to left and right actuator gear boxes and also transfer power to lower transducer which transmits power to tail fin.

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**WING PITCH POINT** is shown here. At about 1000 feet altitude, the wing pitch point is the wing rotation point. Cable control pitch, differential collective and elevator.

also propeller using lateral motion of the control stick.

• Pitch control is achieved by varying the angle of the pitch line to the horizontal tail.

• Downward control is by varying the pitch angle of the wing line around vertically on the right side of the tail, by means of foot pedals.

Pitch and yaw lines are connected as parallel with elevator and rudder respectively. This operates all of flight regimes, the vertical and horizontal possible control surfaces becoming effective as forward speed increases.

#### Control During Conversion

During conversion from level to airplane flight, the lateral control system automatically changes to airplane controls. differential collective pitch system phases out and the conventional elevator system (which operates in reverse during level) simultaneously reverses itself and phases in. With wing held down in airplane configuration, roll control is achieved through the elevator alone.

Collective pitch lever is not affected by wing tilt position and is used as a propeller pitch change lever during



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#### Vertol 76 (VZ-2) History

April 21, 1916—Vertol received contract, sponsored by U.S. Navy and coordinated through Office of Naval Research, to design, build and test a ultralight VZ-2 aircraft vehicle.

Aug. 15, 1917—VZ-2 makes first heavy flight.

Jan. 7, 1918—First flight in airplane configuration.

June 6, 1918—VZ-2 starts build-up toward first full conversion.

July 15, 1918—First full conversion in flight.

flight. With engine speed held constant, the engine governor, the oil active pitch lever controls the thrust in forward flight.

Wing tilt is across angle from 52 deg. when in full vertical takeoff at landing position to 6 deg. when Model 76 is in full airplane configuration.

Flight test development has resulted in a vehicle that can be controlled in an configuration without automatic stabilization systems in winds up to 20 kt. Drift and Pitch, sport. Conversion have been made with the simpler systems turned off. Stability and roll augmentation are provided in the form of pitch and roll rate damping.

Attack control can be maintained without effort and stick trim problems are not excessive during the conversion cycle, the Vertol engineers note.

Test runs can be made at reasonable speeds with wing incidence angles as high as 60 deg., if wing position above 45 deg. can be blown into the cockpit. Pilot has developed a technique for fast deceleration as the ground clearance of lowering the wing pitch needed in the airplane configuration and thus tilting the wing up to act as a drag brake.

#### Germans to Produce Rolls-Royce Turbojets

Boeing-M. A. N. Turbomachinery GmbH, a subsidiary of the mechanical engineering company, Maschinenfabrik Augsburg-Nürnberg, will develop and produce Rolls-Royce jet aircraft engines under license.

The subsidiary is raising its basic capital from \$1,340 to \$12,000 and moving its headquarters to Munich. Initial production is envisaged for the domestic market. Contacts with German aircraft firms have already been initiated.

Most likely candidate for a new M. A. N. Rolls-Royce powerplant would be a proposed 40-ton intercontinental transport for the Chinese air force. Three German designs for such a transport have been submitted to a joint French-

work in the fields of the future at NAA



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**NORTH AMERICAN AVIATION, INC.**



#### Avionic Capability Improved in Latest A4D

Navy Douglas A4D-1N Skyhawk, night attack aircraft for close offshore reconnaissance in A4D-1 and A4D-2, except that aircraft is about 5 ft. longer (AW Nov 17 p. 17). The A4D-2 is equipped with improved weather and navigation capabilities and is designed for pressure and in-flight refueling. Douglas has \$79 million contract for A4D-1Ns.

Italian-German research team, which is expected to reach a decision in December. Forerunner reportedly is a proposal by Henschel Flugzeugbau, one of a consortium of North German aircraft companies possibly building the French Nordavia under license.

#### Bell Tests 47-J For Noise Level

P. Worth-Nose studies conducted by Bell Helicopter Corp. indicate that the Model 47 helicopter is quiet; thus, noise level aircraft at the noise levels generated by these vehicles is public area.

Comparing various sound measurements, Bell engineers found that the

47-J operating within 200 ft. of a jet, about 10 ft. more disturbing than an automobile horn 20 ft. away on a track, stirring up 40 ft. more. Other noise sources showed the 47-J at 500 ft. to be quieter than a train at 100 ft., a truck, moving on the highway, at 20 ft., or a four-engine aircraft taking off at 500 ft.

Bell notes that despite these findings, the helicopter is still considered noisy in most quarters. This is because the sounds of the machine in its test and the test that it makes different types of sound than those normally heard in a domestic area. Comparing that as soon as the majority of rotary helicopter operations were off, the 47-J would attract no more attention than other forms of transportation.



#### SC-1 Tested for Scorching Effect on Ground

Shaw Brothers & Dykes Ltd.'s SC-1 VEEC, under a contract to develop an aircraft for the low dimensional parking Rolls-Royce RB 165 and low engines would have the test. Only effect was slight scorching of grass beneath engine bay.

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## MANAGEMENT

# Rivalry Intense in Soviet Weapon Design

By J. S. Bates, Jr.

(This is the second of two articles dealing with the Soviet management structure for weapon system development.)

Washington-Soviet weapon development is characterized by intense competition and the promise of large financial reward for individual achievement, two features seldom observed in any period of rapid industrial growth.

Final competition between military aircraft designs in Russia is not held on paper.

In the development of an operational aircraft weapon system, the Soviets generally carry two or more designs to the full-scale flight test stage where head-on experimental results are known in direct competition.

The selection of production aircraft is not made until after a flight test comparison.

#### Financial Reward

Financial reward is available to any Russian design group that does what it said it could do. Even the designers who lose a flight test competition receive a bonus if their aircraft achieve the performance that they had originally promised.

Soviet industrial structure is success-



ful, depending on detailing the structure of the Russian weapon development management. And Dr. J. Sterling Livingston of the Harvard Business School, an accomplished student of the Soviet Union, has looked at length to congressional committees on the subject of Russian military management.

His testimony in detailing the structure of the Russian weapon development management. And Dr. J. Sterling Livingston of the Harvard Business School, an accomplished student of the Soviet Union, has looked at length to congressional committees on the subject of Russian military management.

has included the following pertinent statements:

"When this (the Soviet) undertakes the development of a weapon system typically they have three or four scenarios only, two—but typically three or four different design alternatives—two towards. This has a serious effect on the performance of the design of the weapon system."

#### Selection on Merit Alone

"There is another important feature in the Soviet system which we see from our studies. When the Soviets reach the prototype testing stage, they select their weapon model on the basis of its merits."

In another portion of his testimony, Dr. Livingston quoted Maj. Gen. John D. Molyneux, commander of the U.S. Army Ordnance Vehicle Command, who said: "Some place there has to be a man who can make a decision who can give a command and who has the authority to carry it out." Dr. Livingston then commented:

"I certainly agree with that and I think we should have it in mind that the Soviets have used this method at monthly. This, have developed a less sense for being responsible, they provide great incentives for success and they provide very substantial penalties for failure."

The technical freedom and personal authority that Soviet designers have in their comparison with each other also was described by Dr. Livingston. "In

#### Increase in Lead Time Due to 'Concurrences'

| Steps  | Time for "preparation" of concurrence |        |
|--|---------------------------------------|--------|
|  | Weeks                                 | Months |
| 1. Development planning objectives                     |                                       |        |
| (a) Actual preparation                                 | 1                                     | 1      |
| (b) Obtaining concurrence                              | 1                                     | 12     |
| 2. General operational requirements                    |                                       |        |
| (a) Actual preparation                                 | 1                                     | 1      |
| (b) Obtaining concurrence                              | 1                                     | 6      |
| 3. Development plan                                    |                                       |        |
| (a) Actual preparation                                 | 1                                     | 1      |
| (b) Obtaining concurrence                              | 1                                     | 4      |
| 4. Development Director                                |                                       |        |
| (a) Actual preparation and selection of the contractor | 4                                     | 1      |
| (b) Obtaining concurrence                              | 1                                     | 5      |

\* Col. William F. Scott, USAF (source's friend).

Division of outposts over U.S. weapon development progress has started procedure of obtaining concurrence from the same people who participate in making decisions. As shown here, a study by USAF Col. William F. Scott, this procedure takes approximately the same time as that required in actually performing planning work. The National Report, compiled for Department of Defense under direction of Robert Robertson, former Deputy Secretary of Defense, came to a similar conclusion about "concurrence."

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this country," he said, "responsibility for the design and development of weapons is divided between military contractors and the military services."

The division of responsibility is not unique to the Soviet system, and it causes a considerable amount of delay in our nation, particularly because contractors are often unable to accept orders for the design of a great deal of time, to get decisions from the military services re technical details of a weapon system.

### Contracting Procedure

The Soviets have made their philosophy of industrial competition and financial incentives available through what amounts to a contracting system that would be described in the U.S. as fixed fee or performance type contracting. As no real competition could exist without a fixed set of rules to compete by and some clear system of accounting achievement and distribution of funds, one of the main tasks of the Soviet planning authorities has been to draw their contractors, first on "work plans" in Russia.

No matter of subcontracting contracts or work plans could be completely free of factors or disagreements. The Soviet plan affects much of the type of contract between the central planning authorities who write and administer the contracts and the industry groups that carry them out. Some of the reports issued in 1960 show that, very often, the contractors from the Soviet Union have been in the U.S.

Most U.S. observers, however, agree that the Soviet government has varied through and awarded large bonuses and material benefits to successful designers, scientists and others connected with projects that met the targets agreed to in the annual work plan.

A brief description of the life cycle of a typical Russian aircraft project gives some complete picture of Soviet competition, rewards within contracting procedures and placement of the aircraft for design and development in the hands of the designers.

Majority of the Soviet projects pass through four distinct phases:

- Planning to establish a requirement for the weapon and schedule of design to develop in its development
- Design, development and flight test of experimental aircraft
- Production
- Operational use.

Primary responsibility for the end of the aircraft, a project changes in each of the four steps. One of the most significant points about the Soviet system is that design and production groups are separated financially. No good design group is dependent upon the amount of work that it started a production factory, and vice versa. Each

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specific group, whether design or production, stands or falls on the basis of the fulfillment of its own work plan with the state.

Initiation of a requirement for a new aircraft is an, now, complex process from initial mission to design, and in the phase of weapon development, even more complex in about the same way. The complex aspects can come from many quarters, high and low. The head of the state, whether he holds his position by force or by public consent, can call the attention of his experts to any particular which he thinks merits our attention.

Suggestions also can come from industry, community, designers, research scientists and in some cases from people in unclassified occupations.

Regardless of the source of the suggestions, even when a group or groups of like minds place in state new ideas. The exact composition of the Soviet long-range planning group for weapons is not precisely known. However, it undoubtedly includes such groups for other areas of the Russian economy.

### Planning Groups

Naturally, the group concerned with new weapons consists primarily of advisers from the military establishments involved in weapon development, the Soviet armed forces, the Academy of Sciences of the USSR, and its institutes, the intelligence service, high representative of the Government party officials of the Congress, its central economic planning bodies of the Soviet Union, and officials of the Soviet banking system.

The planning group and its sub-groups consider the present position of state of the art weapons, the present work load of industry, the availability of resources, the estimated level of technology, actual work force and many other factors in deciding whether a new weapon is feasible and desirable.

Once the decision has been reached to go ahead in a particular weapon area, very general specifications are laid down regarding desired performance.

The general specifications are then referred to a State Commission in charge of planning the design group, to coordinate the development of the new aircraft. The Minister of the Aircraft Industry, as his personal representative, usually is a member of this commission, as well as top officials in the Ministry of Defense, representatives from the industrial, transportation, training and lighter commands of the Soviet Air Force, several prominent aircraft designers, production experts, members of the central planning and fiscal authorities, and experts from the USSR Academy of Sciences.

The design selection commission

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**ELECTRONIC TETHER**—The Army demonstrates a device developed by Sikorsky for ground control of a flying helicopter using a 50-foot cable. The "tether" aids in hooking up loads to a sling, as shown above, and is also useful for maneuvering near the ground when the pilot's visibility is reduced by darkness, dust or snow.



**100th S-55 HELICOPTER**—Sikorsky Aircraft has completed the 100th S-55, the free world's largest production helicopter. The aircraft was a Marine Corps RH38-1. The S-55 is also built as a U. S. Army troop and cargo carrier designated the H-37A. An S-55 holds the world speed record for helicopters—162.7 mph, set in 1956,



**DROWNING NEW FOREST FIRES**—Flying over a newly-started fire in the woods of Western Canada, a Sikorsky S-55 operated by the Okanagan Group drops 225 gallons of water to control the blaze until fire fighting crews also flown in by helicopters can reach the scene. A large helicopter is better suited for the modern fire fighting technique than a fixed-wing airplane since a direct hit on the fire can be achieved more easily thanks to the 'copter's ability to fly in any direction or

to lower. Small fires can be checked quickly and efficiently, before they grow. The Okanagan Group, whose large fleet includes 1 Sikorsky S-55 and 20 S-55 helicopters, currently operates throughout Canada, performing many important jobs such as providing air transport in support of other installations and carrying mail, food, and supplies to remote areas throughout the country, many inaccessible by other means of transportation.

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"After the plant tests and the corresponding final modifications, the aircraft, together with its ground equipment, is turned over for the flight tests which constitute the completion of the aircraft for final delivery.

"The static tests of the aircraft are made by a commission under a special program and have the purpose of establishing the aircraft's compliance with the assigned specifications. The static tests are made on one aircraft or on several.

"When the static tests are over, any deviations from the assigned specifications, together with the purchaser's suggestions for improvement of the aircraft design, are entered in the protocol by the commission. If the aircraft on the whole meets the specifications, the commission enters a decision that the aircraft can be put into series production. In some cases, the commission, in agreement with the chief designer, is authorized the order and date of introducing the supplementary modification of the test protocol in the aircraft design.

#### Series Demonstration

The amount of hours that the experimental aircraft plant will receive for its work is also determined by this commission.

Sometimes several aircraft which are in competition in one brand category are ordered into production if all do well in the static tests. This is believed to have happened with the new Soviet turboprop and turboprop aircraft and was probably the reason several aircraft are available for military or commercial transport duty.

Several mass production is conducted in "series" aircraft plants, which differ in nature from the experimental plants which have control over the aircraft in the development phase.

The experimental plants are responsible directly to the State Ministry of the Aircraft Industry in Moscow, while the production plants come under the jurisdiction of the Council of National Economy of the various economic regions.

The economic system extended enough to the republics of the USSR. The economic region are controlled by the state through the Council in Moscow, but they have considerable latitude in directing the other firms in their respective areas.

The experimental plants are financed out of the State budget and are considered subordinated. The production plants are termed "independent enterprises" and stand or fall on their profit and loss statements. These means that control has been taken from the state but have to still to the law force as a definite price and sales a profit.

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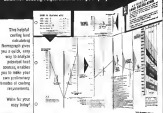
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## Flight Safety Awards Presented

Three aviation figures and the U. S. Coast Guard were recipients of Flight Safety Foundation annual Distinguished Service Awards presented on behalf of Aviation Week at the Atlantic City, N. J., Air Safety Seminar at Elwood R. Qualls (center), administrator, Federal Aviation Agency, and main speaker headed on. Awards were presented to Jerome Lohrman, (second from right) Foundation managing director, to Elton J. Voss Adams, A. C. Redmond, USCGC Commandant, for Coast Guard helming endowments, and to James A. Howell, Helmsick, director, Aviation Crash Injury Research Council, University, for crash injury and survival studies. Edwin A. Lind, president, General Precision Instrument Corp., for design and development of tracking devices, and Otto E. Kuchler, experienced consultant, Boeing Airplane Co., for leadership in design and situation of transport aircraft for accident safety. Nine countries, in addition to U. S. and Canada, were represented.

personal plans is not development work covered by the state work plan and is considered unclassified. Therefore, the experimental plans have two sets of books to cover their activities in both fields. Their unclassified work usually is testing or minor design jobs for other development plans.

### One-Man Management

Production plants are presented as the central of "one-man management" in use, the experimental unit present a description of their activities in terms of "Tillman's test."

An unclassified category (production plant) has the right to enter the competitive field independently, and to contract with suppliers and consumers for the acquisition of raw materials, other materials, fuel and power and for the sale of its finished product (except for that portion covered by the state work plan).

"Business contracts regulate the economic interrelations between enterprises. The character of socialist enterprises is one of the principal demands of the system of unclassified fuel resources. The system of contracts strengthens the responsibility of the enterprises for the fulfillment of the plan and for timely delivery of their

products, and establishes a material responsibility for breach of contract.

"An unclassified enterprise has a complete system of accounting with a balance sheet showing profits and losses.

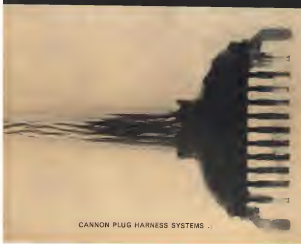
"The state increases the incentive for an unclassified enterprise to fulfill the plan by rewarding the economic independence of the enterprise and making part of its profits available to supplement the working capital, capital in construction and the funds of the enterprise."

Probably the greatest difficulty faced by the production plant in its liaison with the design bureau that developed the aircraft going into mass production.

Two basic relationships exist in this area. In the most prevalent situation, the design bureau has its own shop to build experimental aircraft.

### Experimental Construction

In the other case, the experimental aircraft construction is handled by a "series" plant under contract to the design bureau. The latter method is generally used for very large aircraft such as Tupolev intercontinental bombers Il-76 and Il-86. It is reported that Tupolev is in charge of a "series" plant as well as the development design bureau and that all of the experimental



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and production work, for his benefit comes under his personal direction. Under either of these arrangements, the design bureau is in a professional position. Engineers working in the design bureau make roughly 15% more in salary than the engineers in the production plants, depending upon their caliber. This situation apparently is a particularly severe one facing top Soviet management today.

Any technical change in an aircraft which the "series" plant design services for regional production must be approved by the design bureau. These design changes in regional production are drafted and detailed by the "series" design bureau of the prime "series" plant and are then checked by the design bureau of the design bureau.

Modification of the original design to improve performance or to correct operational deficiencies are handled through the design bureau. Responsibility for and authority over the quality of the production aircraft is placed completely in the hands of the director of the prime "series" plant.

One of the fundamental techniques of Soviet mass production of aircraft is explained by Dr. Le. Gorbunov.

Now here is a major point of departure between these procedures and ours. When design are completed under the Soviet system, production tooling is authorized for all designs that look similar. This means that they tool up at this point for, say, three weapon systems. Looking in advance that they are only going to produce one.

When this production stage is reached, the prototype is tested in flight, two of three weapon systems will be dropped out of the production tooling. For those systems will be accepted and only one will be authorized for production.

Under this procedure the Soviets are not deluged in production tooling and to some extent get into production in one year whereas it normally takes us two and three-quarter years.

Operational responsibilities of the Soviet Air Force, Aeroflot or whatever agency happens to be the customer have when they get into production in one year flight test of the factory. From that point, pilots employed in the "series" plant have tested the aircraft in approximately the same manner U. S. military test production aircraft.

### Britain Orders Australian Jindivik Target Aircraft

Britain has ordered 40 Australian Jindivik target aircraft for guided weapon trials in Canberra Bay (VNA) VNA. VNA of aircraft and spares is about \$14 million. Ministry of Supply and Labor contract is awarded to Armstrong Siddeley Viper ASV engine and then to 50,000 lb.

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Systems engineering, support services and systems management have enabled AiResearch to deliver these vital subsystems to North American's A3J.



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Like other developments in Space Technology, Dyna-Soar, even though not scheduled to fly until the

1960's, will affect thousands of buying decisions tomorrow, next week, next month. AVIATION WEEK anticipated this kind of vehicle in its March 18, 1957 issue—has also described it in other technical articles—in the November 11 and December 16 issues of last year, and in the "Research for Space" edition of June 16, 1958.

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"Already, our design groups plan the supersonic jet transports of 1965. Meanwhile, new speed and altitude records set by a Lockheed F-104 Starfighter move manned flight to the fringes of outer space.

"Within and beyond lie many problems for our engineers: problems in aerodynamics and thermodynamic characteristics at supersonic speeds; in radar, in optics, in missile and data processing for airborne defense systems. Additional long-range problems exist in military systems analysis, nuclear and space craft systems, commercial jet transport studies, and industrial operations research.

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## BUSINESS FLYING



PROTOTYPE Nomad will be used by North American's Columbia Division as a transport and for pilot instrument proficiency checks.

## T-28A Converted to Utility Transport

Conversion of surplus USAF North American T-28A trainers, one of the best fighters of the world with the design of the Navy T-28B, has been developed by North American Aviation's Columbia, Ohio, division, for civil and military utility operations.

Named the Nomad, the conversion is designed for positive transportation instrument proficiency checks, aerial survey operations in an air environment familiar for foreign governments.

Nomad will start flight tests in December to obtain a Civil Aeronautics Administration type certification in the normal and utility categories. North American-Columbia has granted a license to Pacific Engineering Corp., Santa Monica, Calif., to manufacture and handle subsequent conversions. North American will retain the prototype for its own use in compare pilot instrument proficiency checks and for transportation in support of military

operations at various naval air stations. North American reports that the Nomad conversion program was under taken as a result of requests from foreign governments and on the basis of a market survey conducted in Mexico.

Basic features of the remaining program is the conversion of a T-28A T-28A fuselage with a Navy T-28B Wright R-1300-56 engine delivering 1,350 hp and a three-blade Hamilton Standard Hydromatic propeller providing



Jetstar Prototypes Shown Together

More than 70 production Jetstars for the Lockheed Jetstar 680 mph utility transport have been sold to private companies (AW Nov. 17, p. 11). First prototype is at right. Second prototype (left) is equipped with slipper tanks (500 gal each) for long range capability.





# CONTINENTAL APPROVES COMPOUNDED AVIATION OIL

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LEONARD E. BARNETT, CHIEFLIN (141B): "After analyzing results over the years, I find that my Cessna 170 got its 100-hour overhaul. I found the logs still had the original machine marks."

and stabilizing agents, nutrients and solvents, antifoams and acids deactivators, uncoating agents and corrosion inhibitors, shock absorbers, power steering and brake replacement agents.

Flying Physician Aero notes that normal disposal of the aircraft would preclude them from all being destroyed in the event of disaster. Aircraft's small size makes them especially adaptable to landing at unimproved sites, close to the scene of trouble.

The association reports that cost of duplicating currently available facilities, as suggested by its membership, would approximate \$47,500,000. It breaks this down as follows: 1,930 aircraft, with instruments and equipment, \$27.5 million; 1,500 hangars, \$7.4 million; 1,500 pilots in training, and training, at \$5,000 per year, \$7.5 million; 1,500 VFRs in reserve status at \$3,000 per year, \$11.5 million; 1,800 reserves in reserve status at \$3,000 per year, \$5 million; fuel, maintenance, etc., for training, per year, \$1.5 million; administrative and organizational expenses, per year, \$1.5 million and airport and medical equipment and supplies, \$750,000.

The association further notes that the program it used by the government, could readily be extended beyond its 1,500 pilot-teacher membership through volunteer, nonmember wide forms of private planes who would agree to transport nonflying physicians and equipment to remote areas in an emergency.

## Range of Avionics Extended in T-37A

Completely new communications and navigation equipment for the Cessna 1-37A aircraft trainer has been approved by USAF and will be installed in mid 1955. Improved mission capabilities are expected with installation of the new equipment. The original gear has been a source of complaints on the basis of insufficient range. An Army Works aided in its pilot evaluation of the T-37A (AW Apr. 3, 1955 p. 41).

The equipment is being installed in a prototype aircraft for extensive test use, expected to last some six months.

The modification involves installation of the following component: SRC-54 UHF receiver-transmitter providing 5-10 watt peak on each of the available 1,750 channels. Though power channels are available, these may be used by the pilot. As all of the receiving channels can be selected individually, in the pilot. The pilot can select the "Guard" channel at any time by switching from "Pilot" to "Guard" at the channel selector on the control head. Current equipment has only one-half watt output.

A 101 VOR system provides constant



USAF has approved new communications and navigation equipment for Cessna 1-37A. Panel includes: 2-C-1017 UHF/34 output head (receiver-transmitter), 3-4107/3 output control head, 6-4D 230V/400 cycle magnetic indicator, 7-10-107/400V output indicator.

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you enter being automatically when proper frequency is selected. Frequencies can be chosen in 100 kc increments from 105 to 157.9 mc. The ID-250 ARN radio receiver indicator provides a bearing in the main station as well as an auxiliary bearing indicator. An RD 387 ARN provides manual indication.

Each pilot will have a C-524V AIC 100 amplifier control head providing individual microphone systems. A pilot may select various combinations of interphone, communication and navigation reception as well as the "hot mike" feature, which can be turned off. Selector switch has a spring-loaded "off" position which cancels the microphone.

## PRIVATE LINES

New Loosening K250-450-A1A6 fast loosening version of 1-40 for general and specialized on-carbon engine for business airplanes will be available in 1959 model of North American Engines. It also an improved L-71H turbocharger for 11.5 hp, from 1500 to 2700 rpm. The turbocharger is equipped with stainless steel turbine housing, turbine, and turbine. The turbocharger is equipped with stainless steel turbine housing, turbine, and turbine. The turbocharger is equipped with stainless steel turbine housing, turbine, and turbine.

Follow-on contract valued at over \$10 million, covering manufacturing of additional quantities of L-71H Turbochargers, was placed by L-71H configurations. The fast loosening K250-450-A1A6 fast loosening version of 1-40 for general and specialized on-carbon engine for business airplanes will be available in 1959 model of North American Engines. It also an improved L-71H turbocharger for 11.5 hp, from 1500 to 2700 rpm. The turbocharger is equipped with stainless steel turbine housing, turbine, and turbine.

Project A-101, beginning this month of December, the A-101 Co. will provide 15 primary industry with complete training in C-101 1-71A aircraft for each. Students currently receive 30 hr in primary training. Each 1-71A primary training is given in F-101A value that receives 180 hr. Students in Project A-101 will get 115 hr of training in 1-71A. An advanced group in the same class in 1959 will primary school operators in 1959. Students in primary school operator will be trained in 1959. Students in primary school operator will be trained in 1959.

Fixed base for executive aircraft maintenance, including and conversion, has been opened by the National Aeronautics and Space Administration (NASA) at the NASA Center (N-1) Airport, in Langley formerly occupied by Strato-



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The Division is actively seeking for such major, long-term projects as the Air Force Earth Satellite, Q-5 and X-5, Army Knapfiken, Navy Polaris IRBM and other important research and development programs. It was honored at the first National Missile Industry Conference as "the organization that contributed most in the past year to the development of the art of missile and astronautics."

Responsibility, high-level positions are available for experienced personnel in the following:

**Electronics** B.S. or M.E. or equivalent, with experience in one or more of the following: telemetry, instrumentation, radar and communications including radio, radio telephone and high speed telegraph, VLF, telemetry tracking.

**Flight Test Analysis** B.S. required, M.S. preferred, or B.E. or M.E. with strong background in statistical math and minimum 3 years' experience in missile flight test planning and analysis, including knowledge of operational guidance, structural evaluation, dynamic systems and range safety.

**Flight Test Evaluation** Advanced degree required in A.E., M.E., B.E. or M.S. or equivalent with minimum 3 years' experience in one or more of the following: structural control of missile systems tests, analysis and evaluation of missile systems performance, preparation of system reports, missile flight test activities in blackboard, command and launching operational performance evaluation. Liaison with the military is an important part of these assignments.

**Flight Test Operations** B.S. or A.E., M.E. or B.E. with 3 years' experience in missile flight test operations for blackboard, command and launching activities. Liaison with the military is an important part of the assignment.

**Theoretical Physics** M.S. in physics required, Ph.D. preferred, with experience in space physics, or nuclear physics applications, infrared and other detection methods, with ability to evaluate flight test program effectiveness.

For information regarding these and other related positions, please write: Research and Development Staff, Dept. 1711, 363 W. 21st Avenue, Sunnyvale, California.

**Lockheed**  
MISSILE SYSTEMS DIVISION

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**Amateur Radio Service**, Bakersfield, N.Y., is now in operation. Radio Code autopilot and flight control system agents for control U.S.

Major aerial service, including photo mapping at 25,000 ft. and ground profile according to precise specific and accurate records for aerial mapping, is currently being handled by Spectra Air Service (Bakersfield) Ltd., New, Kansas for Missouri, Portuguese East Africa.

Long-range fuel system for Gemini 150 light twin business plane provides total capacity of 330 U.S. gal. on distance of over 150 mi. and still at range of over 5,000 mi. at normal cruise power settings. System provides two 100-gal. tanks mounted in fuselage, behind front seats, at distance of 100 gal. tank can be installed permitting use of one tank out on the right side. Left tank has booster system permitting fuel flow from range tanks in event of engine fuel pump failure. System was developed by R. Rand American, Ltd., New Providence, N.Z. System for carrying and unloading eight standard size tanks of fuel from a Gemini 150 also has been developed by Rand American. System allows a large open-frame cage under each of the plane's wings, fitted to standard supply dropping racks, down under wings are connected to release by means of a manual switch operated by a button on airplane's control column.

Lockheed Civilized sales and service facility in the International City Building, 4471 N.W. 56th St., Miami, is now with expansion of its line of communications, control and navigation equipment for business and airline aircraft. New office is managed by E. A. Bartholomew.

Four Piper Comanches are being delivered to Cuban Airlines, Miami, Fla., Nigeria, for use in agricultural and commercial applications and within work in control and northern Africa. Comanches will replace the former fleet of five lighter and slower aircraft used by the mission.

Piper Comanche number 500 was delivered this month after 10 months after first airplane was loaded over to a customer. Comanche number 500 went to a 35-year-old Texas businessman and teacher, in a 170-hp. Aerobac model. Piper recently is producing four Comanches per working day at Lock Haven, Pa.

## WHAT'S NEW

### Publications Received:

**Solid Propellant Rockets**—by Alfred F. Zischgen—Pub. American Rocket Co., Box 1112, Woonsocket, R.I. \$3.00, 306 pp.

This book brings you up to date on solid propellant rockets. It contains data on almost every solid rocket data table, graphs, diagrams plus a large collection of photographs.

**Nuclear Rocket Propulsion**—by R. W. Hunsford and R. D. McLane, Los Alamos Scientific Laboratory, University of California—McGraw-Hill, Book Co., Inc., 130 West 42nd St., New York 36, N.Y. \$14.00, 170pp.

Comprehensive report bringing together the status, present and expected work of the nuclear and atomic reactor.

**Aircraft Communications Systems**—by J. H. H. Gwyn, A.R.A.S., M.I.N., Philadelphia, N.Y. East 43rd St., New York 16, N.Y. \$4.75, 127 pp.

This book will bring an experienced flight radio operator up to date with modern equipment, and will also be of value to all students wishing for their license.

**Spacecraft Into Space**—by M. Vashutsky with Prof. V. V. Didenko—U.S. Soviet Academy of Sciences, The Dal Press Inc., 401 Fourth Ave., New York 16, N.Y. \$5.75, 104pp.

This book presents a glimpse of the present and future Russian rockets, satellites and missiles.

### Reports Available:

The following reports were sponsored by the Office of Technical Services, U.S. Department of Commerce, Washington 25, D.C.

**A Rocket-Motor Performance**—by R. K. Taylor and M. A. Balthasar, Indiana Steel Products Co., for Wright Air Development Center, U.S. for Tech. 518, 9pp., (PB 131351).

**Double Inertia Magnet Motor Switch**—by L. T. Silva, Anderson Power Crane, U.S. Army 538, 13pp., (PB 131353).

**State of Development of Thermal Rockets**—by A. Penner, J. J. Hines, M. Gader, and C. Z. Wiggins, Quantum Inc. for Wright Air Development Center, U.S. Air Force, March, 1953, 53 pp., (PB 131346).

**Procedure for Determining Vapor Pressure of Mixtures of Low Volatility**—by G. M. Belcher, Wright Air Development Center, U.S. Air Force, February, 1953, 57 pp., (PB 131405).

## ENGINEER OPPORTUNITIES AT RAYTHEON



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| <b>ANTENNA DESIGN</b>             | <b>TECHNICAL WRITING</b>               |
| <b>ELECTRONIC PACKAGING</b>       | <b>SPECIFICATION WRITING</b>           |
| <b>ADVANCED CIRCUIT DESIGN</b>    |  |

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**Flight Test**  
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entire flight test program

**Aerodynamics**  
Must be able to analyze missile configuration to determine  
aerodynamic performance and stability and control  
characteristics

For information on these and other engineering positions, write:

Mr. H. A. Roberts, Dept. 412  
Missile Division  
North American Aviation, Inc.  
12214 Lakeside Blvd., Downey, California

**MISSILE DIVISION**  
NORTH AMERICAN AVIATION, INC.



## WHO'S WHERE

(Continued from page 27)

### Changes

Eng. Gen. Wayne M. Adams (USMC, ret.), military requirements analyst, Systems Electronic Systems, a division of Systems Electronic Products, Inc., Waltham, Mass. Gen. Adams' office will be in Washington, D. C.

Arthur W. Vines, head of newly-formed Information Processing Research Department, Hughes Aircraft Co., Culver City.

Roger J. Killea, manager government marketing, and Kenneth Clark, manager military engineering, American Bosch Corporation, American Bosch Asia Corp., Spring field, Mass.

Rae C. Rinkoff, assistant chief engineer, Casual Dynamics, Strongsville, Canton, Ohio, San Diego, Calif.

Capt. Martin W. Wilson (USN, ret.), manager Navy Insects, Atlantic Division of General Motors, Indianapolis, Ind.

General Electric Co.'s Missile and Space Vehicle Department, Philadelphia, Pa., has announced the following appointments: Mark Norton, manager, in early relief, project operations; Howard M. Wilkins, manager of space vehicle project operations; William R. Egan, manager, guidance, control and test operations; Bernard H. White, test control; C. B. Gosselin, manager, operations and test; A. W. Robinson, manager, future growth study; Lee May, chairman of new applications laboratory; and C. Herbert Ralston, chairman of manager, remote production section at Burlington, Vt.

Dr. Ronald Hirsch, special consultant, Aerospace Engineering Department, Lincoln Corp. Inc., Los Angeles, Calif.

Ed Gledhill, director, North American Aviation's flight test operations at Edwards AFB, Calif. Stanley O'Toole, captain, Mc Gledhill as group leader of engineering flight test at North American's Philadelphia, Calif. facility.

L. Richard Bell, Jr., chief project group, near Scudamond Turbines, a division of Southwest Aircraft Test Co., Pomona, Calif. Mr. Bell continues as chief design engineer. Also James A. Reeves, project control manager, Vela program.

Dr. Lee Kunkel has been appointed professor and chairman of the department of astronautical engineering and director of the Daniel Guggenheim School of Aeronautics of New York University's College of Engineering, New York, N. Y.

Capt. Carlos Hilla, technical manager, LTV, the Vought's Vought, in Anaheim, A. Branson's general manager, LTV's Miami office.

George H. Reynolds, vice president in customer requirements products division, Customer Relations, Goodyear Aircraft Corp., Akron, Ohio.

Robert Earl Clark, chief engineer, Gary Dynamics, San Gabriel, Calif.

W. E. Clay, assistant to the vice president of engineering, Raytheon Division of Northrup Aircraft Inc., Van Nuys, Calif.

Leo W. Tobias, Jr., manager, Milwaukee, Wis., operations, AC Spark Plug Division of General Motors, Flint, Mich. Also Aigle A. Hensley, resident manager of AC-Milwaukee operations.



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## FOCAL POINT FOR SYSTEMS PLANNING



The Bendix Systems Division is located in a new, modern structure situated adjacent to the Engineering campus of the United University of Michigan in Ann Arbor. In new home, back this year, is divided equally between laboratory and office space. The first wing is several new units planned for the Division, the building is designed and completely equipped for the research and development of weapon systems.

The Systems Division, staffed with qualified engineers and scientists, is devoted to the exploration of new approaches to the development of military weapon systems. Serving as a focal point for the active Bendix Corporation, it serves numerous divisions from beginning weapon concept to final system production.

If you are seeking an opportunity to engage in the development of advanced weapon systems and are a qualified engineer or scientist, you are invited to visit the Bendix Systems Division, Dept. A1024, Ann Arbor, Michigan. While working, you will be able to advance your education by attending distance classes at the University of Michigan. And both you and your family will enjoy the many benefits of living in a good university town in the heart of Michigan's "Motor Wheel" area.

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IBM Kingston, New York, is a fine community. It combines country living with easy proximity to New York and other metropolitan areas.

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## LETTERS

### Runway Lighting

Capt. Robison's article, "The CAA Strays Alone" (AW Sept. 13, p. 31), would have been more convincing had he not listed a number of items out of context to make it appear that no one would accept responsibility for CAA Technical Report No. 116. The complete paragraph makes it quite clear that the Office of Technical Services assumes no responsibility since the report originated in another agency. This is a standard notice and on all such reports printed and offered for sale to the public is that office.

Did the CAA "read clear" in the decision to allow booklighting at Washington National Airport? The Airline Transport Association made the following recommendations to the FAA regarding the proposed booklighting:

"Booklighting is a widely used, but the trade show segment would be primarily allocated to an active sales airport to attract looking at exhibits of such lighting can be considered as airport hours' responsibility. The FAA is not responsible for such as Newark, Illinois, or Washington should be selected. We would have no objection to moving these booklighting to Washington National for better traffic flow. We would like to see the FAA make a decision on this matter."

The National Business Aircraft Assn. summed up its comments to the CAA with the following recommendations: "In short, we believe that additional lighting is required to enhance the appearance of the Washington National Airport."

The statement that "it was reported at the beginning of this program that CAA personnel were against" such lighting and "were attempting to kill edge lights" is not factual should have been written. It was apparent at the beginning of this program that CAA personnel did not believe that current basic light models worked, as well as wide beam lights at the runway edge (Narrow beam lights in the runway edge center or unobstructed light pattern where only a few feet from runway centerline). Available data was not enough to suggest that the CAA when the flood lights performed as well as the previous lighting at Andrews Field.

Before my flight, I was notified at 10:00 a.m. that Jim Harding and I had down the entire glass system in 10 minutes down to sea-surface level and we both experienced difficulty in getting exactly bright at 1000 ft. (I cannot believe today that it took 10 minutes to get the lights on at 1000 ft. The system was 1000 ft. in length. However, with only 716 ft. of ship length, they measured 1000 ft. from the money threshold. Jim and I were both able to land in the Modified area with consistent precision in visibility down to 700 ft. rarely went lower (Capt. Bob said we did not land at sea level, but made two passes). In other words, he tried the lights in approach lights only.)

Capt. Nelson notes that the CNA is gathering pilot comments on Washington National Airport flooding in winter storms. 100 ft. ceilings and one mile run halts in order to clear freewheel runways. Our contractors to the extent of

Assistant French minister the spokesman of his readers on the issues raised in the magazine. The spokesman is *André de la Motte*, a 30-year-old, handsome Frenchman, 300 E. 42nd St., New York 17, N. Y. He is deep-settled under 500 words and gives a passionate identification. "We will not permit anonymous letters, but anyone of writers will be withheld on request."

During the questionnaire answered that the form is attached to *Right* almost every day. "Right" was scheduled to read during the hours of darkness when the magazine was at its lowest ebb only.

An important reason for developing a new style of socialism is that they will be

about 214 U.S. embassies constructed in the U.S. in 1960, and many of these buildings need improved lighting systems. It is generally conceded that we cannot "fix up" a big airport for the time required to install access gate systems in the same period.

When a governmental agency conducts an evaluation program, such as the one in question, unless security matters dictate otherwise, it is obligated to make its report on its findings available to the public. The CIA has had numerous reports in the past results at Andrews Air Force Base and Report No. 157 has been used to supply this demand.

Steven F. GATES  
Flight Operations Specialist  
Civil Aeronautics Administration  
Washington, D. C.

(The foregoing letter was forwarded to

Capt. Proctor and following in the night. —  
Ed.)

34. Gagne is reading the same. The point is that there are enough such and similar and official letters on Super 338 to cause men, people temperately people in other countries to I specifically pointed out to believe that this is a complete and last final report and one which has come straight up to its field. The only "fact" here is that it represents the feelings of a few people in GNA.

In regard to the headline analysis in National Target it is noted that the same people advocated this position—I am concerned. This is not the new edition. The problem is that CAA is a standing weight to sports obtained in neither which is of little significance. CAA is using these sports, from which they have not had the opportunity to fly the narrow gap light to balance their position on edge headline.

Landings were set outstretched on the Andromeda runway in the Corvus 240 and to its most popular ground observer. My column as the subject (NW July 29, 1977, p. 47) stated: "Since the satisfaction is impossible, the various factors were simplified on top of the runway surface. Because of their steel and massive observation actual touchdown was avoided. Ge-

When a government agency (or person)

for the latter) consists in evaluation is correctly aligned to assist its findings; it is also aligned to assist its findings in an unbiased fashion. Report 150 observations half its space devoted holding up a negative case against every page later this process in other findings. In the of this to consider the results obtained to other people connected with the entire time-period when the GAA is reported to represent and show were very much known as an open meeting. This is the of substance; however, which is aligned from the GAA and which is aligned larger will disappear under the. Donade R. C. Marcano  
Alfonso, M.

### Rules Exist

Once the name of H. B. Davis, *Seaboard* Club, in the Sept. 1 issue of *Aviation*, *Wren* (p. 90), appears a letter entitled "Nightplane Rides." Mr. Davis tells the regulations and control of nightplane and states the outcome of a student pilot taking off with two passengers from an unlighted runway at night after a midnight party, which suggests the pilot being drunk or at least having been drinking.

Obviously, Mr. Davis is not a pilot. He apparently does not know of the other

of an regulations regarding flight a private aircraft, as he would not have written the letter asking for additional regulations. The pilot of the flight in question said: "I departed 10 or 15 long-established regulations (which were known to him since he had a student license), among them being he was not permitted to fly at night, nor

Mr. Davis does not see anything about the accidents and deaths caused by this same type of person getting into cars and driving after midnight parties, but just how the same discrimination and the same loss of life and property. It seems there will always be some people foolish enough to do a little drinking and recklessly, some of them.

people have a pilot or student license. I suppose the pilot in question was killed and probably the passengers. Should the pilot have faced the penalty should have been very heavy, and severe, not only to compensate for damage but to make an example at warning to others. But, now and more like? What good could they do? We have rules against such things, including murder, but they still happen.

Fortunately, deaths from lightbulbs are down as decreasing all the time. Whether students still take down toll, but are being cut down to better engagement better even country phones, and better treatment than any for the pilots. The "banning" as those all students are decreasing, too, as students are taught more in the line of non-country travel instead of flying the think.

at the airport for a course of instruction he would see that the rules and regulations are there, but it still takes some more work and is some time in looking.

GEORGE M. SACCA  
Williamsburg, Va.



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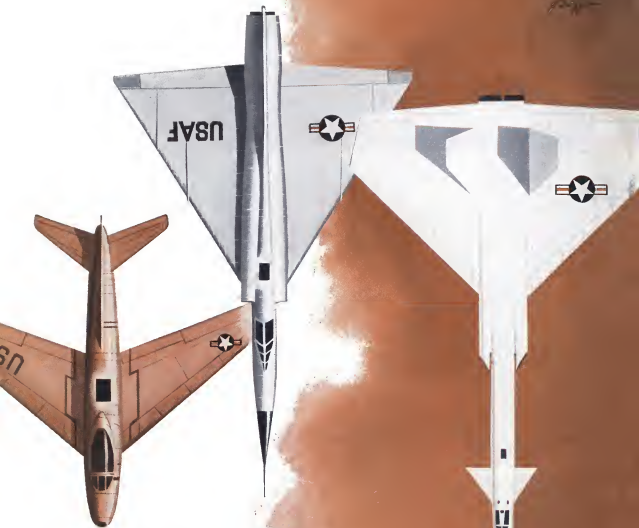
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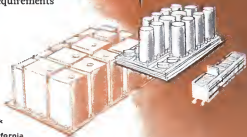


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